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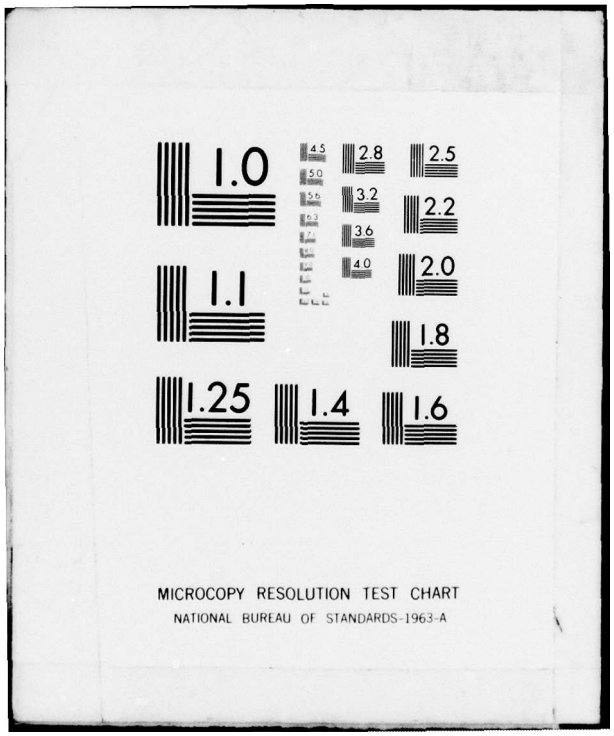
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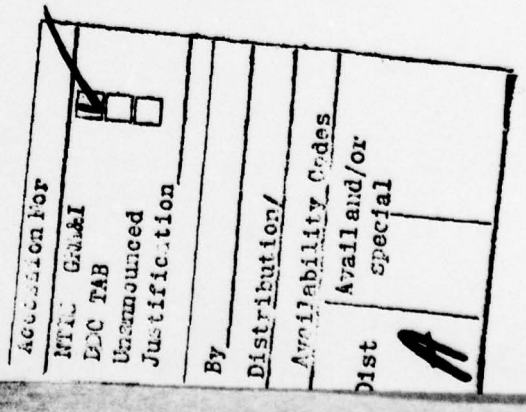

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I. SCIENTIFIC AND ENGINEERING INVESTIGATIONS

A. Department of Aeronautics

1. An Investigation of Unsteady Vortex Entrapment on an Airfoil

Principal Investigator: Maj John P. Retelle, Jr., Department of Aeronautics; Capt Michael S. Francis and Capt John E. Keesee, Frank J. Seiler Research Laboratory (AFSC).

Associate Investigators: Capt Glynn E. Sisson, and Capt George W. Sparks, Jr., Department of Aeronautics; Cadet Kenneth R. Wavering, Class of 1979; Cadet Leo M. Moore III, Class of 1980.

Sponsored by the Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

A combined experimental and analytical effort is considering the feasibility of trapping vortices formed on an airfoil due to dynamic stall. Initial wind tunnel tests use an airfoil which is programmed to move in both pitch and axial translation. Data from surface pressure transducers and a laser Doppler velocimeter will be employed to determine the optimum motion parameters to prolong the additional lift produced during dynamic stall. Some additional work was done to complete the investigation of oscillating-fence type spoilers on airfoils.

Publications

"Formation of a Trailing Vortex," Journal of Aircraft, 16(3), March 1979.

"A Technique for Vorticity Measurement in Unsteady Flow," AIAA Journal, 17(4), April 1979.

"The Development of a Laser Doppler Velocimeter System for Unsteady Separation Flow Research - Preliminary Results," SRL-TR-78-0010, F. J. Seiler Research Lab, October 1978.

"Water Tunnel Measurements of Unsteady Separation," SRL-TR-78-0011, F. J. Seiler Research Lab, December 1978.

"Unsteady Boundary Layer Flow Reversal in a Longitudinally Oscillating Flow," SRL-TR-78-0005, F. J. Seiler Research Lab, August 1978.

Presentations

"Aerodynamic Characteristics of an Unsteady Separated Flow," AIAA paper number 79-0283, AIAA 17th Aerospace Sciences Meeting, New Orleans, LA, 15-17 January 1979.

"Current Research in Unsteady Flow Separation at the USAF Academy," Invited presentation, Unsteady Flow Workshop/Seminar, AIAA Atmospheric Flight Mechanics Conference, Boulder, CO, August 1979.

2. Development of a Skin Friction Measuring Device for Use in Turbomachines

Principal Investigator: Capt Howard M. Brilliant, Department of Aeronautics.

Associate Investigators: Lt Col Roger W. Gallington, Department of Aeronautics; Dr. G. David Huffman, Purdue University.

Sponsored by the Air Force Aero Propulsion Laboratory (AFAPL), Air Force Systems Command (AFSC).

The purpose of this project is to evaluate triangular-shaped block gages for measuring the skin friction coefficient in turbulent boundary layers. This gage will be small enough to fit inside of turbomachines, where small clearance and limited volume make it difficult to measure boundary layer properties. During FY 1979, the test set up, including test model and data acquisition system, was designed; required hardware was ordered. Testing is expected to begin in early CY 1980 and will last several months.

A secondary task of this project is to calibrate Preston tubes for measuring skin friction coefficient. These will be used by the AFAPL in tests at the National Bureau of Standards. A water channel device has been built for these tests. Preliminary tests were conducted in July 1979. Calibration tests will be conducted in October and November.

3. Prediction of Instantaneous Distortion for the YF-12C Inlet

Principal Investigator: Capt Howard M. Brilliant, Department of Aeronautics.

Associate Investigator: Carol Bauer, NASA Dryden Flight Research Center.

In cooperation with NASA Dryden Flight Research Center.

The investigators developed a method of predicting expected maximum instantaneous distortion for the inlet of NASA's YF-12C flight test vehicle and for wind tunnel inlet models. The method uses fewer high response total pressure probes than used in the conventional method of measuring instantaneous distortion. These total pressure measurements are used to determine the statistical properties of the flow in the inlet. Then, applying statistical methods to fundamental fluid mechanics, the investigators predicted the expected maximum instantaneous distortion. In general, the predicted distortion indices were within 20 percent of the measured value using the conventional method; the predicted combined distortion index was within 5 percent of the measured value.

Publication

"Predicted and Measured Maximum Instantaneous Distortion for Flight and Wind Tunnel Model Data for a Mixed-Compression Inlet," H. M. Brilliant, C. A. Bauer, and R. A. Davis, unclassified extended abstract published in Aeronautics Digest, Spring 1979.

Presentation

"Predicted and Measured Maximum Instantaneous Distortion for Flight and Wind Tunnel Model Data for a Mixed-Compression Inlet (U), H. M. Brilliant, C. A. Bauer, and R. A. Davis, presented at the YF-12 Experiments Symposium, NASA Flight Research Center, 13-15 September 1978 (Secret).

4. Description of the Wake of a Canard

Principle Investigator: Lt Col Roger W. Gallington, Department of Aeronautics.

Associate Investigators: Capt Glynn Sisson, Department of Aeronautics; C1C Ken Barker (presently 2/Lt, Class of '79); C1C Seth Minster (presently 2/Lt, Class of '79); C1C Richard E. Crandall (Class of '80).

In cooperation with NASA-Ames Research Center.

Our objective is to quantitatively describe the complex flow occurring in the wake of a canard surface as the wake passes over the main wing. This flow pattern is capable of producing high lift coefficients and well-behaved stability derivatives at high angle of attack and, therefore, is of great interest in the design of maneuverable aircraft and missiles. This experimental program uses the USAF Academy subsonic wind tunnel and the data acquisition system and will produce detailed maps of the flow for comparison with NASA's numerical predictions.

During the past year we have: (1) designed and built a large wind tunnel model and several pressure probes; (2) calibrated two probes using the computer-based data acquisition system; and (3) written computer programs to position the probe and take and reduce data.

Cadet Crandall and Capt Sisson expect to take and reduce our first complete set of data during the fall 1979 semester and have various graphical descriptions of the flow drawn by the data acquisition system. Three cadets enrolled in the Aeronautical Laboratory course will calibrate a unique seven-hole probe intended to measure flow angles up to 90 degrees. Hopefully, the results of both of these efforts can be published in the fall 1979 Aeronautics Digest.

Publications

"A Fast Method for Accurate Manufacture of Small Five-Hole Probes," Aeronautics Digest, Spring 1979.

"Calibration of Five-Hole Probes for On-Line Data Reduction," Aeronautics Digest, Spring 1979.

5. Calibration of Twelve Aerodynamic Probes

Principle Investigator: Lt Col Roger W. Gallington, Department of Aeronautics.

Associate Investigators: Capt Tom Bolick, Department of Aeronautics; C1C Edward E. Lemelin (presently 2/Lt, Class of '79).

In cooperation with the Air Force Armament Laboratory.

The performance of a large number of external aerodynamic probes commonly used on aircraft and missiles to measure total

and static pressures and flow angles is poorly known and documented. Our objective is to fill in important gaps in the existing probe data.

During the past year we have: (1) designed and built fixtures for holding seven probes; (2) designed and built a new pressure measuring system capable of rapidly acquiring accurate pressures from the blow-down wind tunnel; and (3) selected, procured and brought into operation a wind tunnel total pressure controller which is absolutely necessary to make measurements of the required accuracy.

During the fall of 1979 we expect to take and reduce the bulk of the required data. A fall 1979 Aeronautics Digest paper will describe the total pressure controller performance.

6. Supersonic Drag Prediction

Principal Investigator: Capt Eric J. Jumper, Department of Aeronautics.

Associate Investigators: 2/Lt Glen Schlotterbeck, 2/Lt Gary Harris, Department of Aeronautics.

Sponsored by the Air Force Weapons Laboratory, Kirtland AFB, New Mexico.

The original project objective was to investigate novel ways of determining a "best" protuberance design. I use the word protuberance to mean a pod-type shape attached to an existing aircraft. I use the word "best" to mean that when comparing two or more alternative protuberance designs, some sort of qualitative measure can be made to decide which will produce the minimum aerodynamic drag in the supersonic regime of Mach numbers less than say 2.5 (the lowest drag design is then the "best" design).

The project has now evolved to exploiting a modified supersonic area rule technique via the computer. Using this technique we hope to show that the fast computer algorythm we have created is capable of discriminating "best" protuberance design. We have, to our satisfaction, shown that our computer program is capable of predicting aerodynamic differences in subtle design changes. We have checked our results by performing wind tunnel tests. At this time we are in the final phase

of the work. In this phase we are predicting the aerodynamic performance of protuberance designs for the F-15. We will compare our computations with wind tunnel tests performed at McDonnell-Douglas in St. Louis.

Publications

"Wave Drag Predictions on Slender Bodies of Revolution Using the Supersonic Area Rule," Aeronautics Digest, Fall 1978, February 1979, pp. 60-75.

B. Department of Astronautics and Computer Science

1. PASCAL Evaluation

Principal Investigator: LCdr John M. Hartling, USN, Department of Astronautics and Computer Science.

This project involves an evaluation of the PASCAL language on the B6700, and a comparative analysis with ALGOL. The purpose is to determine the feasibility of using PASCAL as the in-house programming language.

2. Over-the-Horizon Radar

Technical Advisory Group Member: Lt Col John A. Zingg, Department of Astronautics and Computer Science.

An experimental Over-the-Horizon (OTH) radar system is being erected to evaluate its capability of providing operational long-range tactical early warning of aircraft approaching North America. The system is currently undergoing installation and acceptance testing. This will be followed by a period of system testing, evaluation and determination of system capabilities. A fully operational system would provide wide area surveillance and real time detection and tracking of aircraft. The OTH radar system represents the only large volume tactical early warning system available at reasonable cost.

3. F-16 Estimating and Budgeting System (FEBS)

Principal Investigator: Capt Douglas Lyda, Department of Aeronautics and Computer Science.

Associate Investigators: Lt Col John A. Zingg, Lt Col Joseph Monroe, and Capt William Ayen, Department of Aeronautics and Computer Science.

The F-16 multinational and cooperative production aspects presents unique management acquisition problems. To streamline the financial management, computer science personnel of the Air Force Academy Astronautics and Computer Science Department have used the computer expertise to design a computerized software system which will generate the Weapon System Budget Estimate (AF Form 1537) used in preparing the yearly Program Objective Memorandum (POM), integrating the SPO overhead rates model, and incorporating flexible output formatting to include intermediate item printout used in the 1537 line items. The system which incorporates over 300 different cost algorithms provides a rapid turn-around capability to estimate costs for "what ifs," POM exercises, inflation and labor ratio sensitivity analysis and Foreign Military Sales (FMS) planning and budgeting. The project is now completed and has replaced the manual system in preparing the FY 80 POM.

4. Advisory Committee on Education and Training for the Ada Computer Programming Language

Principal Investigator: Maj Vance A. Mall, Department of Astronautics and Computer Science.

The Ada Computer Programming Language, developed under the sponsorship of the Defense Advanced Research Projects Agency (DARPA), is intended to become the single modern high order language for use in embedded computer systems. Because the proper introduction of a new language is a key to its acceptance, DARPA formed this committee to build a corporate understanding of how best to present the language. The membership of the committee is drawn from the principal DoD education and training agencies.

C. Department of Chemistry and Biological Sciences

1. Citizen's Workshop Program on Energy and the Environment

Principal Investigator: Capt Ronald E. Watras, Department of Chemistry and Biological Sciences.

Associate Investigators: Col David W. Seegmiller, Lt Col Hugh T. Bainter, Lt Col John H. Birkner, Lt Col Harvey W. Schiller, Maj James R. Wright, Maj James T. Norelius, Capt Elroy A. Flom, Capt John A. Klube, Capt Ronald E. Channell, Capt Clifford M. Utermoehlen, Department of Chemistry and Biological Sciences; Dr. Phil Kearney, Colorado

State University, Fort Collins, CO; Dr. Mike Lowenstein, Solar Energy Research Institute, Golden, CO; Mr. Roger Howard, West Junior High School, Grand Junction, CO.

Sponsored by the Department of Energy through Interagency Agreement.

Citizen's Workshops are educational programs that give citizens an opportunity to learn more about energy and environmental needs and problems. Participants get a chance to try their hand at solving some of the energy-environment problems facing the nation today by using an Energy-Environment Simulator.

The Energy-Environment Simulator is a specially designed analog computer that simulates real-world conditions. Energy resources, energy demands, and environmental effects are programmed into the electronic device. As the clock speeds time by at the rate of a century a minute, participants must make decisions about the allocation of energy resources. They do this by operating controls on remote panels in response to the changing situation. The simulator constantly translates these commands into new conditions. The sequence continues until all the fossil fuels are exhausted--and the game ends.

The workshops now being scheduled have as many as three parts: (1) a slide orientation dealing with the basic facts related to energy; (2) a decision-making game played by participants using the Energy-Environment Simulator to observe the effects of a wide range of decisions involving energy use and environmental protection; and (3) a feedback session where questions raised by the program are discussed.

During FY 79 the Citizen's Workshop Program was responsible for conducting 240 presentations to a total audience in excess of 6,500 people. This level of activity has ranked the USAFA program in the top 15 percent nationally in 8 out of the 12 reporting periods and in the top 10 percent in 3 out of the 12 reporting periods. The contract requires that a total of 20 presentations be given during the fiscal year. The USAFA program has averaged 19 presentations per month. The USAFA will retain the contract for FY 80.

2. Pattern Analysis and Correlation of Weather and Air Pollution Data in the Pikes Peak Region

Principal Investigator: Capt Elroy A. Flom, Department of Chemistry and Biological Sciences.

Associate Investigators: Maj C. R. Mitchell and Capt James Crowley, Department of Mathematics, 2/Lt Stephen Thompson, Department of Chemistry and Biological Sciences.

Sponsored by Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

This project is a continuation of one initiated in 1977. The major effort has been to establish a three-year data base of air pollutant and weather data in order to establish what correlations might exist between these parameters. The data base is complete. Simple correlation as well as time series analyses have been applied to the data base. Initial studies show that air pollutant levels correlate well with the weather parameters of dew point and temperature. A spinoff project is the investigation of particulate level reduction by paving of roads in El Paso County.

Publication

Flom, E. A. and S. J. Thompson. 1978. An analysis of airborne particulate level reduction resulting from paving of gravel roads. Frank J. Seiler Research Laboratory Technical Report TR-78-0012, United States Air Force Academy, CO.

3. Photochemical Energy Storage

Principal Investigator: Captain Dennis J. Fife, Department of Chemistry and Biological Sciences.

Associate Investigator: Captain Larry P. Davis, Frank J. Seiler Research Laboratory (AFSC).

Sponsored by the Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

The purpose of this study is to evaluate the kinetics and mechanism of sensitization of the photoisomerization of norbornadiene (NBD) to quadricyclane (Q) in order to effectively design

new sensitizers offering improved characteristics. The isomerization of NBD to Q is a process utilizing a photochemical reaction to give a storable high energy product which may be controllably converted to starting material with a corresponding release of stored energy. Norbornadiene was photolyzed at 313 nm using three different sensitizers. Cuporous chloride and acetophenone are known sensitizers. A tertiary phosphine complex was also used as a sensitizer with a quantum yield of approximately 0.80 calculated. Present plants call for continuation of this project as partially fulfilling Capt Fife's doctoral requirements at Utah State University.

4. Reaction of Mesylate Esters with Energetic Alcohols

Principal Investigator: Maj Robert E. Cochoy, Department of Chemistry and Biological Sciences.

Sponsored by the Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

This program was initiated to prepare energetic fluorodinitroethyl ethers for use as plasticizers and binders in explosive and propellant applications. Alkyl methanesulfonates (mesylates) derived from alcohols were proposed as starting materials in lieu of the more expensive alkyl trifluoromethane sulfonates (triflates) derived from alkyl halides currently used.

Butyl mesylate, a model compound, was reacted with fluorodinitroethanol catalyzed by a variety of acids and bases. The catalysts that were tried included triethylamine, pyridine, magnesium sulfate, sodium bicarbonate, triflic acid, and trifluoroacetic acid. In order to achieve different reaction temperatures and to accommodate the varying solubilities of the catalysts, a variety of solvents including ether, chloroform, glyme, diglyme, and 1, 2-dichloroethane were used.

In all cases, none of the desired alkyl fluorodinitroethyl ether was formed due presumably to the fact that mesylates are so much less reactive than triflates in the S_N2 displacement reaction.

5. Determination of the Effects of Wastewater Reuse

Principal Investigator: Capt Randal A. Gaseor, Department of Chemistry and Biological Sciences.

Associate Investigators: Lt Col John H. Birkner and Capt Robert A. Peterson, Department of Chemistry and Biological Sciences.

Sponsored by the Cold Regions Research and Engineering Laboratory, Corps of Engineers, U. S. Army, Hanover, NH.

This project is a continuation of one initiated in 1976. The effort of the study has been to examine the wastewater treatment capabilities of the lagoon system at the Air Force Academy. In addition, the monitoring of the terrestrial ecosystem to determine the long-term effects of extended wastewater irrigation has been continued. This program is being continued and expanded to include the determination of the effects of aeration on the biological availability of trace metals in wastewater lagoons. Sponsorship has transferred from the Frank J. Seiler Research Laboratory (AFSC) to U. S. Army Cold Regions Research and Engineering Laboratory, and is expected to continue through FY 80.

Publication

Gaseor, R. A. 1977. Studies of the use of non-potable irrigation on the Air Force Academy Golf Course. Frank J. Seiler Research Laboratory Technical Report TR-77-0008, United States Air Force Academy, CO. (Note: Although this publication was released during FY 78, it was inadvertantly omitted from the Annual Research Progress Report No. 13).

6. An Evaluation of Worldwide Endeavors in Genetic Engineering

Principal Investigator: Maj Robert H. Zellers, Department of Chemistry and Biological Sciences.

Associate Investigators: Lt Col John H. Birkner, Capt Martin D. Zahn, and Capt Robert A. Peterson, Department of Chemistry and Biological Sciences.

Sponsored by the Defense Intelligence Agency.

This is an on-going evaluation that was begun in FY 76. Current research in genetic engineering is being monitored through literature reviews, personal interviews, and attendance at appropriate symposia. Collection of information results in an analysis of trends and progress in genetic engineering efforts with emphasis on potential applications.

7. Chemical and Microbiological Monitoring of Sites Previously Used for Storage of Military Herbicides

Principal Investigators: Maj William J. Cairney, Department of Chemistry and Biological Sciences; Maj Alvin L. Young, Epidemiology Laboratory, USAFSAM, Brooks AFB, TX; Lt Col Charles E. Thalken, Occupational and Environmental Health Laboratory, Brooks AFB, TX; Dr. B. Mason Hughes, Flammability Research Center, University of Utah.

Sponsored by Air Force Logistics Command.

This study is part of an overall effort by Air Force Logistics Command to reclaim, decontaminate, and restore areas formerly used for the storage of Military Herbicides. The two former storage areas are respectively located at the Naval Construction Battalion Center, Gulfport, Mississippi, and on Johnston Atoll in the Pacific Ocean. The initial phase of decontamination is chemical and microbiological site monitoring. Forty-three sites have been selected at each location for analysis. Test sites were selected on the basis of heavy herbicide spill and heavy herbicide odor (designated H/H), light herbicide spill and odor (designated L/L), and no detectable spill or odor (designated O/O). In addition, controls were selected from locations adjacent to former storage areas which had never received any herbicide. Testing of these sites for 2, 4-D, 2, 4, 5-T, and associated dioxins is in progress and will continue over a two-year (or more) period. Levels and diversity of soil microflora are currently being determined and will be correlated with levels of herbicide to assess the possible effects of herbicide on microflora and possibly provide data on the role of microorganisms in herbicide biodegradation. The Flammability Research Center at the University of Utah is uniquely suited to provide Mass Spectrometric chemical analytical support. Dr. Mason Hughes has personally developed all of the protocol being used and is able to analyze for 2, 4-D, 2, 4, 5-T and breakdown products at a resolution unattainable anywhere else in the world. In addition, he has assembled an automated, computer-linked system which provides rapid results. Present experimental results indicate that high levels of herbicide and dioxin are present in storage site spills. Microbial studies have shown that application of 2, 4-D and 2, 4, 5-T at massive rates (5000-40,000 ppm) not only did not sterilize the soil, but actually stimulated the growth of some soil microorganisms. Data presently being received from the latest samples are beginning to yield information on degradation rates in the two former storage sites.

8. Analysis of TCDD in Biological Samples

Principal Investigators: Maj William J. Cairney, Department of Chemistry and Biological Sciences; Maj Alvin L. Young, Epidemiology Laboratory, USAFSAM, Brooks AFB, TX; Dr. Michael Gross, Department of Chemistry, University of Nebraska.

Sponsored by Air Force Logistics Command.

In support of the Air Force Logistics Command project on Disposition of Herbicide Orange, the Department of Chemistry and Biological Sciences has been conducting extensive research on the fate of TCDD (2, 3, 7, 8-tetrachlorodibenzo-p-dioxin, a contaminent of Herbicide Orange) in the environment. Since 1975, personnel of this department have been collecting soil and biological samples from areas exposed to Herbicide Orange and TCDD. Over one hundred samples have been collected for analysis of TCDD at the parts per trillion level (ppt). In addition to the collection of materials from areas directly exposed to Herbicide Orange, water, soil, and biological samples have also been taken from areas up to one mile away from contaminated areas to assess the rate at which herbicide and TCDD may be moving into adjacent ecosystems. The analysis of TCDD in biological systems requires a complex extraction and clean-up system in addition to highly sophisticated instrumentation. No Air Force laboratory currently has this capability. Two universities currently do have, but only one (the University of Nebraska) is available. The University of Nebraska is currently under contract to the Department of Chemistry and Biological Sciences, USAF Academy, to analyze these biologicals. A technical report is forthcoming which will summarize all of our past data on the fate of TCDD in biological systems and incorporate the results from the University of Nebraska analyses.

9. Fate of Herbicide Orange in Soils

Principal Investigators: Maj William J. Cairney, Department of Chemistry and Biological Sciences; Maj Alvin L. Young, Epidemiology Laboratory, USAFSAM, Brooks AFB, TX; Dr. H. H. Cheng, and Mr. Joseph T. Majka, Department of Agronomy and Soils, Washington State University.

Sponsored by Air Force Logistics Command.

This cooperative field study is being conducted jointly by the Department of Chemistry and Biological Sciences, USAF Academy,

and the Department of Agronomy and Soils, Washington State University. The study is attempting to assess breakdown products of both high and low concentrations of 2, 4-D and 2, 4, 5-T n-butyl esters applied at rates comparable to spills in former AFLC Herbicide Storage Sites. A combination of ring and side chain labeled ^{14}C-2, 4-D or ^{14}C-2, 4, 5-T n-butyl esters is being used in experiments which will provide data on probable degradation pathways, identification of metabolites, and rates of degradation. Field minilysimeters have been installed at the Washington State University Department of Agronomy and Soils Experiment Station. Corresponding microbial analyses are being conducted at the USAF Academy which will correlate levels of herbicide and herbicide metabolites with microorganism populations and diversity.

10. The Effect of Hyperbaric Oxygen on Mycotic Disease Agents

Principal Investigator: Maj William J. Cairney, Department of Chemistry and Biological Sciences.

This research is presently unsponsored. The project attempts to determine oxygen toxicity limits for selected mycotic disease agents in an effort to find expanded application for the USAF Compression Chamber Treatment Facilities (i.e., Hyperbaric Chambers). Students in English 330 have done extensive literature reviews on various aspects of the project using computerized systems including BIOS and Index Medicus. Experimental work will be undertaken during Academic Year 79-80 as one or more Bio Sci 499 projects. Preliminary results indicate that a number of mycotic disease agents have oxygen toxicity limits within levels readily tolerated by susceptible humans and animals.

11. Comparison of Stress Responses in Male and Female Cadets at the USAF Academy

Principal Investigators: Lt Col Orwyn Sampson, Lt Col Hugh T. Bainter, and Maj John B. Bomar, Department of Chemistry and Biological Sciences.

Sponsored by the Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

This project consisted of a pilot study in which 50 female subjects from the Class of '80 were examined in terms of their response to the stresses of medium altitude and the Basic Cadet

Training Program at the Air Force Academy. The parameters of study included 6 hematology and 18 serology variables. Samples were taken at the beginning and throughout BCT. Baseline data were obtained and analyzed using a least squares fit computational technique.

A continuation of this project to include longitudinal comparison of cadet male and female stress responses was envisioned. However, this has been determined to be impractical because of time and manpower constraints.

Publication

Sampson, O; H. T. Bainter, and J. B. Bomar, Jr. 1978. Comparison of stress responses in male and female cadets at the United States Air Force Academy. Frank J. Seiler Research Laboratory Technical Report TR-78-0015, United States Air Force Academy, CO.

12. Ultrastructural Analysis of Mammalian Tissues Exposed to Depleted Uranium

Principal Investigator: Capt William D. Butler, Department of Chemistry and Biological Sciences.

Sponsored by the Air Force Armaments Testing Laboratory, Air Force Systems Command (AFSC), Eglin AFB, Florida.

Twenty Peromyscus polionotus (beach mice) were chronically exposed to low dosages of Triuranium Octaoxide (U_3O_8) otherwise known as Depleted Uranium (Du), in the laboratory. Postmortem examination of control and test mice (exposed for 30, 37, 44, and 51 days to 500 μg/gm U_3O_8 mixed with 0.2 gm Purina mouse chow, and given orally) revealed slight observable difference in spleen and adrenal gland sizes. The other internal organs and glands were quite uniform in size and shape. Initial X-ray microprobe analysis using the AMR 1000 Scanning Electron Microscope interfaced with the PGT 1000 digital computer indicated slight positive indications of tissue uptake of the heavy metal (U_3O_8). Stereological analysis of liver photomicrographs completed September 1979. Tissue preparation, sectioning, staining, and microphotography are now complete with correlation and analysis yet to be accomplished.

13. Chemiluminescent Gas Phase Reactions

Associate Investigator: Maj Chester J. Dymek, Jr., Department of Chemistry and Biological Sciences.

Sponsored by the Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

This project involves determination of critical data relevant to the chemical laser system based on chemical generation of O_2 ($^1\Delta$) and subsequent transfer to atomic iodine, the lasing species. Using an ESR spectrometer to measure O_2 ($^1\Delta$) and O_2 ($^3\Sigma$) generated by microwave discharge of O_2, we determined an upper limit to rate of quenching of O_2 ($^1\Delta$) by Cl_2 of 10^{-16} cc/molec-sec. A generator based on the Cl_2/H_2O_2 (basic) reaction has been constructed for use in mechanistic and quenching studies. Runs of long duration (over one hour) have produced steady outputs of O_2 ($^1\Delta$) in percentages exceeding 25 percent. Variations in generator parameters has begun and much useful information on its performance has already been obtained.

Publication

"Chemiluminescent Gas Phase Reactions," AFOSR Conference, 3-5 October 1979, United States Air Force Academy, Colorado. C. J. Dymek, Jr.

14. Physical and Electrochemical Measurements

Principal Investigator: Dr. J. S. Wilkes.

Associate Investigators: Lt Col L. A. King, Lt Col A. A. Fannin, Jr., and Capt R. A. Carpio, Department of Chemistry and Biological Sciences.

Sponsored by the Frank J. Seiler Research Laboratory, Air Force Systems Command (AFSC).

Work was centered on physical properties of potential molten salt batter electrolytes. Density and conductivity data for the $LiCl-AlCl_3$ system were obtained in the liquid range and reduced to functions of temperature and mole fraction. The liquidus diagram for the low-melting ternary $KCl-NaCl-AlCl_3$ were made and reduced to equation form. A generalized polynomial fitting routine based on minimum distance techniques for the above measurements.

Publication

Fannin, Jr., A. A., R. A. Carpio, L. A. King, and F. C. Kibler, Jr. 1979. Conductivities of $AlCl_3$-rich molten $AlCl_3$-LiCl mixtures. Journal of the Electrochemical Society, 126:1650.

D. Department of Civil Engineering, Engineering Mechanics and Materials

(Effective 1 July 1979, the Department of Civil Engineering, Engineering Mechanics and Materials split into two new departments: the Department of Civil Engineering (DFCE) and the Department of Engineering Mechanics (DFEM). Since nine (9) months of the work reported herein was accomplished under DFCEM, it is being reported in this manner. Individuals are identified according to their new departments.)

1. Dynamic Response of a Seismically Stable Platform

Principal Investigator: Capt Francis S. Heming, Jr., Department of Engineering Mechanics.

Associate Investigators: Maj Richard M. Hanes, DFCE; Capt Harvey D. Bartel, DFCE; and Capt David A. Glasgow, DFEM.

Sponsored jointly by 6585th Test Group, Holloman AFB, New Mexico, and Frank J. Seiler Research Laboratory, USAFA, CO.

The research effort on this project has just begun. The principal focus at this time is the experimental analysis of a simple modal using available model analysis software. Experience gained in this effort will then be applied to a more complex model prior to a full-scale experimental and analytical study of the USAFA Isopad. The long-range goal will be to evaluate proposed designs for a new and more sophisticated testpad.

2. Dynamics of Aircraft-Runway Interaction

Principal Investigators: Lt Col Joseph J. Cox, Jr., Department of Engineering Mechanics, and Capt Ralph R. Gajewski, Department of Engineering Mechanics.

Sponsored by the Air Force Engineering and Services Center (AFESC), Tyndall AFB, Florida.

The project, Aircraft Response to Bomb Damaged Runways, has concentrated on providing quick response engineering consultation on the dynamics of aircraft-runway interaction. This past year, reviews were made on proposals to use statistical techniques to predict aircraft response, to build a stationary test facility to simulate aircraft response, and to use a "tuned-mat" repair patch to reduce aircraft response. In addition, modal analysis techniques are being used to analyze test results and computer simulations. This consulting research project is scheduled to continue through 1985.

Publication

"A Literature Search and Review of the Dynamics of Aircraft-Surface Interaction," CEEDO-TR-78-39, June 1979.

3. Fracture Mechanics

Principal Investigator: Maj Thomas E. Kullgren, Department of Engineering Mechanics.

The finite element-alternating method is applied to problems of semi-elliptical cracks in irregular bodies. This three-dimensional solution method produces mode-one stress intensity factors along the crack periphery and crack opening displacements. Present work centers around circumferential cracks in pipes and cracks near fastener holes in plates under general loading.

Publications

"The Finite Element-Alternating Method Applied to Benchmark No. 2," International Journal of Fracture, 14, December 1978.

"Part-Elliptical Cracks Emanating From Open and Loaded Holes in Plates," Journal of Engineering Materials and Technology, Vol. 101, pp. 12-17, January 1979.

Presentation

"Static Fracture Testing of PMMA Plates Having Flawed Fastener Holes," Society for Experimental Stress Analysis, Spring Meeting, 21 May 1979.

4. Fracture Mechanics in Contact Problems

Principal Investigators: Professors L. M. Keer, Department of Civil Engineering, and H. S. Cheng, Department of Mechanical Engineering and Astronautical Sciences, Northwestern University, Evanston, Illinois.

Associate Investigator: Capt George K. Haritos, Department of Engineering Mechanics.

Sponsored by Frank J. Seiler Research Laboratory, USAFA, CO.

This project was initiated by the U. S. Army Research Office, Research Triangle Park, North Carolina, 27709, in the form of a grant awarded to Professors Keer and Cheng. Research at USAFA is being conducted concurrently with that at Northwestern University under the sponsorship of Frank J. Seiler Research Laboratory. This work is aimed at gaining a basic understanding of the complex stress behavior which governs pitting and scuffing failures in heavily loaded lubricated contacts, known as elasto-hydrodynamic contacts. The applications of these contacts include gears, cams, and rolling element bearings. Several fracture mechanics analyses have been completed to date, and a technical paper is being prepared at this time. This work is scheduled to continue through August of 1980.

5. General Second Order Component Mode Synthesis with Application to Rotor Bearing Systems

Principal Investigator: Capt David A. Glasgow, Department of Engineering Mechanics.

A method of component mode synthesis has been developed which is applicable to general linear second order systems to include general viscous damping and nonsymmetric stiffness and damping terms. Computer programs used in the analysis have been successfully applied to numerous rotor bearing systems resulting in whirling modes and stability information. Analyses are complete for general forced response due to maneuver loads, unbalance, and blade loss dynamics. Computer codes for the forcing problem are under development.

Publications

"Stability Analysis of Rotor-Bearing Systems Using Component Mode Synthesis," D. A. Glasgow and H. D. Nelson, ASME Paper No. 79-DET-63, September 1979.

"Eigenrelations for General Second Order Systems," H. D. Nelson and D. A. Glasgow, AIAA Journal, Vol. 17, no. 7, pp. 795-797, July 1979.

Presentation

"Stability Analysis of Rotor-Bearing Systems Using Component Mode Synthesis," ASME Design Engineering Technical Conference, St. Louis, 10 September 1979.

6. Hot Corrosion

Principal Investigator: Maj George W. Watt, Department of Engineering Mechanics.

Sponsored by the National Science Foundation.

The research has been divided into two main areas of investigation. The first has been to study the electrochemical probes that are typically used as reference electrodes in molten Na_2SO_4. The second part of the research involves the electrochemical study of corroding samples of chromium, nickel and nickel-aluminum alloy under a thin film of Na_2SO_4. The experimentation has been completed and the data has been analyzed. In August of 1979, this work was presented in partial fulfillment of the requirements for the Doctor of Philosophy Degree at The Ohio State University. The oral exam was held on 1 August 1979 and the degree was granted on 30 August 1979.

Publications

"A Comparison of Reference Electrodes in Molten Sodium Sulfate," Proc. 2nd International Symposium on Molten Salts, J. Braunstein, Ed., The Electrochemical Society, Princeton, 1979.

"Electrochemical Investigation of Hot Corrosion," PhD Dissertation, The Ohio State University, 1979.

Presentation

"A Comparison of Reference Electrodes in Molten Sodium Sulfate," 1978 Fall Meeting of Electrochemical Society, Pittsburgh, PA., October 1978.

7. Indian Ocean Station 60-Foot Antenna Drive System Failures

Principal Investigator: Capt Mark S. Ewing, Department of Civil Engineering.

Sponsored by the Air Force Satellite Control Facility (AFSCF), Sunnyvale AFS, California.

The Indian Ocean Station (IOS) 60-foot antenna drive system has experienced an unacceptable failure history. As a result, limitations were imposed on the system performance via hardware replacements. These limitations are unacceptable for satellite tracking. The purpose of the investigation is to advise AFSCF which hardware replacements will allow both acceptable performance and avoid down-time due to mechanical failures.

8. Metal Joining/Consulting

Principal Investigator: Capt Patrick K. Talty, Department of Engineering Mechanics.

Sponsored by U. S. Department of Energy through Lawrence Livermore Laboratory (LLL), University of California.

DOE is responsible for the design and production of all nuclear weapons required by DoD. An area of major concern and potential problem is metal-to-metal joining used in the production of warheads. This project, through a consulting effort, examines these metal joining problems, and through research efforts conducted by personnel at LLL and the Rocky Flats Plant (a DOE production facility) attempts to alleviate their impact on production schedules. This year's effort is focused on a metal joint planned for use in the eight-inch Artillery-Fired Atomic Projectile (AFAP) currently entering production. An additional year of consulting is planned to insure the adequacy of this metal joint to meet all DOE and DoD requirements for this warhead.

9. Solar Energy

Director: Col Wallace E. Fluhr, Professor and Head, Department of Civil Engineering.

Principal Investigator: Capt Kenneth A. Cornelius, Department of Civil Engineering.

Associate Investigators: Capt Joel D. Benson, Capt Gregory E. Riggs, Capt Anthony Eden, Department of Civil Engineering.

Sponsored by the Air Force Systems Command (AFSC) through the Air Force Engineering and Services Center (AFESC).

The Solar Heating Retrofit of Military Family Housing Project is terminating 30 September 1979. During the past year, the project continued to collect performance and operation/maintenance data for the installed solar system. Particular emphasis was placed on comparing the performance and capabilities of evacuated tube solar collectors with flat plate collectors. The latter months of the project consisted primarily of preparing the Solar Test Home for turnover to the Base Civil Engineer and assignment to a non-engineer resident. Tasks included removal of all research associated equipment, fabrication and installation of a typical "homeowner type" of solar controller and various other measures designed to make the system as dependable and maintenance-free as possible.

Publication

Project Final Technical Report is now in preparation.

Presentations

"The USAFA Solar Energy Initiative," Woodmoor SERTOMA Club, October 1978.

"Performance of the USAFA Solar Test House - A Retrofit Application," Solar Heating and Cooling Systems Operational Results Conference, November 1978.

"Solar Energy," Question/Answer session on "Talkback" Radio Station KCSJ Program, May 1979.

"USAFA Solar Test House," International Solar Energy Society Section Meeting, Colorado Technical College, May 1979.

10. Structural Mechanics

Principal Investigator: Capt George K. Haritos, Department of Engineering Mechanics.

This work investigated the plane elasticity problem of a finite, rigid rectangular block partially embedded in and perfectly bonded to an elastic half space. Three distinct sets of loads are applied to the embedded block so that it either translates without rotation in the vertical or horizontal direction or rotates about an axis in the out-of-plane direction. Several important physical quantities are computed, e. g., the stress distribution throughout the elastic half-space, the diffusion of the load from the block into the elastic half-space (for the case of vertical translation), and the rotational stiffness. A technical paper has been accepted for publication in the International Journal of Solids and Structures and is currently in press.

Publication

"Stress Analysis of a Rigid Block Embedded in an Elastic Half Space," PhD Dissertation, Northwestern University, Evanston, Illinois, 1978.

Presentation

"A Loaded Rigid Block in an Elastic Half Space," presented at the Third American Society of Civil Engineers/Engineering Mechanics Division Specialty Conference, The University of Texas at Austin, September 1979.

11. Turbine Engine Metal Matrix Composite Blade Analysis

Principal Investigator: Capt Paul D. Copp, Department of Engineering Mechanics.

Sponsored by Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio.

This project consists of analytical studies of metal matrix composite materials subjected to two phenomena. The first study entitled "J-79 Boron/Aluminum Transient Impact Analysis" deals with Foreign Object Damage (FOD) due to bird strikes on jet engine compressor blades. This analysis utilizes the NASTRAN finite element code that has been modified to allow transient modal analysis and direct integration with centrifugal loading. In addition, one-dimensional and two-dimensional bird load models were analyzed. Some of the computer analysis has been completed using the ARPANET system. The final report is being prepared. The second project deals with the analysis of composite materials

subjected to dynamic loadings. This program has incorporated composite laminate theory into a fully functional quadralateral isoparametric plate element in the SAP IV finite element computer code. The results of this program are excellent. The final report is being prepared and a follow-on effort is under consideration. A three-week TDY was spent at WPAFB to work on these two projects during July of 1979.

12. Vibration Characteristics of a Thin, Cracked Plate

Principal Investigator: Capt Mark S. Ewing, Department of Civil Engineering.

A stator in a turbine engine may become cracked during service, thus changing its vibration characteristics. The purpose of this study is to quantify the change in vibration characteristics by modeling the stator as a thin plate with a crack. An energy solution technique is used and substantiated with experimental testing of a thin, rectangular plate.

Presentation

"Vibration Characteristics of a Thin, Cracked Plate," 50th Shock and Vibration Symposium, Colorado Springs, Colorado, October 17, 1979.

13. Wind Energy Conversion Systems (WECS)

Principal Investigator: Maj Thomas E. Kullgren, Department of Engineering Mechanics.

Associate Investigators: Maj Dennis Wiedemeier, Maj Gary Brown, Capt Steven Boyce, Department of Civil Engineering.

Sponsored by the Air Force Engineering and Services Center, Tyndall AFB, Florida.

The USAF Academy WECS project has two parts: the design, fabrication, and testing of a small vertical axis wind turbine (VAWT); and the analysis of USAF Academy winds for future large wind turbine siting. The VAWT was erected in August 1978 and suffered a structural failure in November 1978. It was re-erected in July 1979. The entire system, to include controls and data acquisition, was fully operational in September 1979. The wind site survey task includes data gathering and analysis of information from four instrumental recording stations.

Presentation

"USAF Academy Vertical Axis Wind Turbine Development Program," Small WECS Conference, Boulder, Colorado, February 27, 1979.

14. Evaluation of the Maverick Alternate Warhead (AGM-65E) Missile Performance

Principal Investigator: Capt Lonnie D. Phifer, Department of Civil Engineering.

Sponsored by the Aeronautical Systems Division (ASD/SD65), Wright-Patterson AFB, Ohio.

The principal investigator was the on-station test director during the planning and test initiation phases of the program. The objective of the test program is to evaluate the effectiveness and missile/aircraft compatibility of a heavier warhead in the Maverick missile. During this investigation a frequency clearance authorization problem was identified and resolved, deployment of the test team to Dugway Test Range (Hill AFB, UT) was accomplished, and a plan to modify and certify the missile handling equipment at Eglin AFB was developed and placed in effect. A Flight Test Working Group to include SPO, Eglin AFB, U. S. Navy, and contractor personnel was established to enhance communications and to identify and resolve problem areas. Field tests on the program are to be conducted during the remainder of CY 1979.

E. Department of Electrical Engineering

1. Missile Test and Evaluation

Principal Investigator: Capt John A. Criscuolo, Department of Electrical Engineering.

Sponsored by the Director of Advanced Technology, Space and Missile Systems Organization, Los Angeles, California.

A ground mobile, easily dispersable ballistic missile is under study for deployment by the NATO forces. Planning for the development design verification testing as well as the production qualification and early operational evaluation was researched, analyzed, and reported. A preliminary Test and Evaluation Master Plan (TEMP) was published.

2. Data Acquisition System Development

Principal Investigator: Capt John R. Maneely, Department of Electrical Engineering.

Sponsored by the Central Inertial Guidance Test Facility (CIGTF), Holloman AFB, New Mexico.

The purpose of this research project is to develop a special purpose digital data acquisition system to acquire precise performance information from inertial guidance components being evaluated for use in Air Force weapons systems. The data acquisition system will be a digital processor which acts as an interface between test instruments and a mini-computer which analyzes and stores test data. When completed, the new data acquisition system will replace a less capable system now employed by the CIGTF.

3. Some Computational Aspects of Bayesian Decision Theory Applied to Multi-Sensor Correlation

Principal Investigator: Maj Clayton V. Stewart, Department of Electrical Engineering.

Associate Investigators: Capt David Dise, Lt Peter Pasko, Lt Curtis Johnson, C1C Glenn Rosenberger, C1C Phillip Fitsjarrell.

Sponsored by the Fire Control Branch, Air Force Avionics Laboratory.

There currently exist numerous Air Force programs, including Integrated Strike Avionics and Fighter Fusion, that are chartered to produce an automatic target identification system utilizing multisensor correlation. In such a context, it is well known that Bayesian decision theory yields an optimal target identification assuming all underlying statistics are known. The Academy research effort demonstrates the feasibility of using an off-the-shelf, 8-bit microprocessor to implement a multivariate, multiclass Bayesian decision rule. The project also investigated the degradation in performance of such an algorithm under assumptions of various types of statistical errors that are likely to occur. A paper that described these results was published in the Proceedings of the 1979 DoD Non-Cooperative Target Recognition Conference.

4. 8086 Microprocessor System Development

Principal Investigator: Capt Joseph J. Pollard, Department of Electrical Engineering.

Sponsored by F. J. Seiler Research Laboratory, USAF Academy, CO; Air Force Flight Dynamics Laboratory, WPAFB, OH.

The purpose of this research project is to develop a state-of-the-art high speed high throughput 16-bit microprocessor based computing system for general applications to research currently being conducted by F. J. Seiler Research Laboratory and the Air Force Flight Dynamics Laboratory, WPAFB, OH. The system features floating point arithmetic capability using the AM9511 APU as well as a sixteen-channel $\pm$ 100 volt hybrid subsystem. Software is being developed using PLM-86. The system includes a dual drive single density Shugart floppy disk system. Hardware completion is estimated 31 October 1979 with software and system documentation completed 31 December 1979. Benchmark testing will take place in the spring of 1980.

5. Study of the Undergraduate Laboratory Activity in the Department of Electrical Engineering

Principal Investigator: Lt Col Albert J. Rosa, Department of Electrical Engineering.

The purpose of this study has to determine if the present undergraduate laboratory curriculum satisfactorily met the three-fold purpose of supporting the educational goals set down by the Commission on Engineering Education, of providing connections between courses thereby allowing for better integration of ideas and enhancing learning, and finally, of providing a means for evaluating a student's effective domain behavior.

Presentation

Lt Col Rosa at the 8th Annual Conference on Frontiers in Education paper titled, "Integrated Laboratory Experience," Lake Buena Vista, October 23-25, 1978.

F. Department of Mathematical Sciences

1. An Optimum Formulation of the Finite-Element Method for the Diffusion Equation with Respect to the H^0 Norm

Principal Investigator: Capt Charles R. Martin, Department of Mathematical Sciences.

Unsponsored

This project is an investigation of various finite-element techniques especially variations of the Crank-Nicolson method for solution of the diffusion equation. The goal is to find a method for which the error in the mean square sense over the entire solution domain (the H^0 or L_2 norm) is much smaller than for presently available methods. Results so far indicate that there is a minimum error condition in this norm for sufficiently large values of the Fourier modulus. Additionally, a side investigation is being conducted using high order Pade rational approximations in lieu of the low order Crank-Nicolson scheme to approximate the temporal behavior of the solution.

2. Defense Medical Care Evaluation

Principal Investigators: Lt Col W. T. Hodson, Lt Col I. C. Shields, Maj J. C. H. Smith, Department of Mathematical Sciences.

Sponsored by OSD/Assistant Secretary of Defense for Health Affairs.

The purpose of this research is to develop a new measure of output for military health care facilities. The work is concentrating on using currently available data from the newly implemented Uniform Chart of Accounts to develop a highly refined measure which can be used to improve the capability to monitor and improve facility performance.

3. Network Protocol

Principal Investigator: Capt Eden Y. Woon, Department of Mathematical Sciences.

Sponsored by the Air Force Weapons Laboratory.

Captain Woon worked as a consultant with the Air Force Weapons Laboratory and contractors on the problem of priority in communications networks in CONUS. His effort expanded on Paul Boran's work on "Distributed Communications Network."

4. DMA/USAFA R&D Program

Principal Investigators: Maj John D. Maybee and Capt David A. Nelson, Department of Mathematical Sciences and Capt James M. Lind, Education Research Computer Center.

Sponsored by the Defense Mapping Agency.

The DMA/USAFA R&D Program is directed at the problem of developing three-dimensional models of urban/industrial scenes using digital stereo imagery processed by an image processing system (IPS). During the past year, possible approaches to the problem have been investigated by means of a literature search and attendance of two relevant conferences. General approaches have included the disciplines of image understanding/artificial intelligence and photogrammetry. In addition to the basic research efforts, an invitation for bids was submitted through procurement for an IPS. A contract was obtained from the Stanford Technology Corporation and delivery of their I^2S IPS is expected in early November.

5. Mathematics Education

Principal Investigator: Maj Samuel B. Thompson, Department of Mathematical Sciences.

The research is to explore methods of improving educational outcomes and reducing resource expenditures within the Department of Mathematical Sciences. Some results of this research are generalizable to other academic departments and to the higher education community at large. Research has encompassed the following projects: (a) large scale experimental comparison of individualized mastery instruction as an alternative to conventional instruction in core mathematics, (b) statistical analyses of reliability and predictive validity of mathematics achievement measures and scoring systems, (c) large scale experimental comparison of homogeneous and heterogeneous aptitude sectioning in core mathematics.

Presentations

Colorado-Wyoming-Kansas Mathematics Conference (Oct 78).

National Conference of the American Mathematics Association of Two Year Colleges (Oct 78).

Fifth National Conference on Personalized Instruction (May 79)

6. Defense Medical Resource Study

Principal Investigators: Lt Col I. C. Shields, Maj J. C. H. Smith, Department of Mathematical Sciences.

Sponsored by OSD/Assistant Secretary of Defense for Health Affairs.

The purpose of the study was to examine the underutilization of government and civilian health care facilities. The study analyzed the patient loads at other military, government and civilian hospitals resulting from the closure of each military hospital.

Publications

Military Hospital Closure: A Preliminary Study, Office of the Secretary of Defense, Defense Resource Management Study, Washington, DC, 1979.

7. Estimation of a System Transfer Matrix

Principal Investigator: Capt William P. Baker, Department of Mathematical Sciences.

This project is concerned with developing the transfer matrix for a multi-input, multi-output system given sufficient frequency response data. The data are accepted as amplitude-phase measurements; however, the fitting is done in the real-imaginary domain. Due to the non-linearity of the measurement errors propagated from the amplitude-phase domain to the real-imaginary domain, a weighting matrix must be determined to obtain a least-squares estimate in the amplitude-phase domain. The algorithm currently developed is an iterative method which has been very successful on several test data sets. A user's guide is being written and a copy has been requested by the Air Force Weapons Lab.

8. Large Region Location Problems

Principal Investigators: Maj Daniel W. Litwhiler, Jr., Department of Mathematical Sciences, Dr. Adel A. Aly.

This study is concerned with finding a point on the sphere which minimizes the weighted sum of the distances to M given destination points on the sphere. Two algorithms are presented and theoretical results concerning the reduction of the search region are developed. In the literature, location problems are confined to the Euclidean space, mainly location on a plane and location on a network. The discovery that the Earth was essentially spherical created problems for cartographers that are still being investigated today. It is well known that there exists no isometric (length-preserving) transformation from a sphere to the plane. This eliminates the possibility of a transformation so that Euclidean geometry can be used to measure spherical distances. Transformations on the non-Euclidean spherical space are combined with efficient solution techniques in E'. An example problem illustrates the possible magnitude of error due to a planar assumption for a non-Euclidean space. Due to the nature of the problem (non-convexity) a local optimum is obtained. Some computational experience is reported.

Publications

Maj Daniel W. Litwhiler, Jr., and Dr. Adel A. Aly, "Large Region Location Problems." Computers and Operations Research, Vol. 6, No. 1, pp. 1-12.

9. Police Briefing Stations: A Location Problem

Principal Investigator: Maj Daniel W. Litwhiler, Jr., Department of Mathematical Sciences and Dr. Adel A. Aly.

The research concerns an application of location theory in the public sector. The problem involved development of a reliable technique to assist the Oklahoma City Police Department in selecting the locations of two police briefing stations to supplement an existing police headquarters. Difficulties encountered in applying "textbook methods" to solve an actual problem and how they were resolved are discussed. Accordingly, data collection, model development, and solution techniques are also presented. Quantitative results of a test application are included. Final site selection was based upon results of this study and other qualitative factors such as zoning requirements, land availability, political considerations, potential growth and environmental impact.

Publications

Maj Daniel W. Litwhiler, Jr., and Dr. Adel A. Aly, "Police Briefing Stations: A Location Problem." AIIE Transactions, Vol. II, No. 1, March 1979, pp. 12-22.

10. Math Modeling and Identification

Principal Investigators: Maj Raymond Zazworsky, Capt David Jensen, and Capt William Baker, Department of Mathematical Sciences.

Sponsored by Frank J. Seiler Research Laboratory.

The general research goal of this project is to study the realization problem with particular emphasis on data set realization. Due to the non-uniqueness of minimal realization, our objectives were to characterize the set of all minimal realizations and then to characterize that subset, if it is non-empty, which contains all stable minimal realizations. With these characteristics, an algorithm will be developed which seeks out a stable minimal realization. Consultation with the Air Force Weapons Lab (AFWL/ALO) and the Central Inertial Guidance Test Facility (CIGTF) is being continued to provide alternate approaches to noise modeling needed in Kalman Filtering.

Publications

A paper titled, "The Set of All Minimal Partial Realizations" will appear December 1979, Vol. 24, of IEEE Transactions on Automatic Control. This paper is jointly authored by Maj Zazworsky, Capt Jensen and Capt Baker.

11. Digital Signal Sorting: Sorting of Digital Speech from Common Data Signals

Principal Investigator: Capt Roger E. Salters, Department of Mathematical Sciences.

Sponsored by the Air Force Avionics Laboratory.

This project concerns the investigation of signal process techniques that will allow the identification of the analog source(s) of the digital data in a communication network. In particular, a decision directed algorithm is being developed that will recognize whether the parent analog source is speech or non-speech. The approach is based on the unique dynamic characteristics of the speech generation process that are independent of the language being spoken. The invariants of the speech generation process appear to be the well defined clustering neighborhood of the predictor coefficients of an auto regressive-integrated-moving average (ARIMA), pole-zero model, of the transfer function of the vocal tract. The classification process employs some concepts from distortion-rate

theory, and the eigenvalues of the covariance matrix of a speech process. The essential analysis effort of the feasibility study has been completed and an Air Force Academy Technical Report is being written. Possible follow-on effort will include a small simulation of the developed technique. This will be reported in a Technical Memo Supplement to the primary USAFA Technical Report.

12. Casebook of Examples on AF Applications of Statistics

Principal Investigator: Maj S. J. Monaco, Department of Mathematical Sciences.

Sponsored by the Department of Mathematical Sciences.

The purpose of this project was to provide a casebook of examples of statistical applications which would serve as a resource for all department instructors and could be used in many courses to illustrate and motivate the subject matter. It was also anticipated that these examples would serve to help build on the creative skills and imagination of our cadets since it is only by dealing with real problems, their pitfalls and difficulties, that the student can understand how to actually apply theory to practice.

This project was terminated with a short report on 1 June 1979. No further work is anticipated at this time.

13. Core Math Data Base

Principal Investigator: Maj Kenneth R. Keck, Department of Mathematical Sciences.

Sponsored by the Department of Mathematical Sciences.

This project has been used to build a data base of core math problems/questions which can be used for homework, boardwork, quizzes, graded reviews, and final exams. The problems are all stored in a common format. The base is indexed both by mathematical subject and by key word. Approximately 1500 problems/questions have been input to the base, covering most of the subjects taught in core math at USAFA.

14. A Continuous Time Storage Model with Markov Net Inputs

Principal Investigator: Maj Nelson S. Pacheco, Department of Mathematical Sciences.

A model for a dam is considered in which the net input rate (input minus output) follows a finite-state continuous-parameter Markov chain. The cumulative dam contents are given by the integral of the Markov chain, suitably modified to allow for the analysis of the unrestricted contents process, the semi-infinite dam, and the finite dam. For the unrestricted contents process, the range is analyzed as a way of determining preliminary dam sizing information. The Laplace transform of the distribution of the range is obtained, and explicit inversion is performed in special cases. The method of invariant imbedding, used extensively in astrophysics and in neutron transport theory, is applied to the analysis of passage-time distributions. When the release rate is constant, the method yields first-order non-linear differential equations with initial conditions obtained from the easily derived behavior of a dam with zero capacity. Some possible correlation functions for the increments of the cumulative input process are examined when the underlying Markov chain is stationary. A functional central limit theorem for the unrestricted contents is proved, establishing weak convergence to the Wiener process in $D(0, \infty)$.

Publications

Maj Nelson S. Pacheco and P. J. Brockwell, "Invariant Imbedding and Dams with Markovian Input Rate." Journal of Applied Probability, to appear September 1980.

G. Department of Physics

1. Analysis of Photometric Data on the Massive Eclipsing Binary Star V382 Cygni

Principal Investigator: Capt Raymond H. Bloomer, Jr., Department of Physics.

Associate Investigators: Dr. Edward Burke, Department of Physics, King College, Bristol, Tennessee, and Dr. Robert Millis, Staff Astronomer, Lowell Observatory, Flagstaff, Arizona.

The eclipsing binary star system V382 is one of thousands of known double star systems with short periods of revolution which display light variations due to mutual eclipses. However, V382 is one of very few, very hot "O-type" stars known to exist as eclipsing systems. In 1975 and 1976 the investigators obtained approximately 1400 data points in three standard wavelength bands on five different telescopes. The photometric data centered on 5500 Å has

now been analyzed using the complex computer code of Wilson and Devinney. The inclination of the orbit is now definitely known to be $86.^{\circ}25 \pm 0.^{\circ}25$. The masses of the stars can then be extracted from the radial velocity curves of Popper and they are 26.9 and 19.0 times the mass of the sun. An oral paper was presented to the 154th meeting of the American Astronomical Society in June; the interest generated has suggested some other possible approaches to solving the light curve. After these proposals are attempted a written paper will be prepared.

Presentations

Bloomer, R. H., Burke, E., and Millis, R. L., "New Photometric Observations of V382 Cygni," presented to the 154th Meeting of the American Astronomical Society, Wellesley, MA, June 1979.

2. Satellite Lightning Studies

Principal Investigator: Capt Bobby N. Turman, Department of Physics.

The new field of lightning detection from space has been developed from experiments with the Vela satellites and special packages on the DMSP and STP satellites. A wealth of data are now becoming available. For the first time, global lightning distributions are available for atmospheric research, global electrical modeling, and site hazard assessments. Recent analysis also suggests that lightning flash rate may be an effective means of detecting the development of tornadoes. An experimental spectroscopic study of lightning flashes is now underway to provide design information for future lightning sensors and the information will also be used to assess the lightning noise problem for operational remote sensing systems. This project is supported by the F. J. Seiler Research Laboratory.

Presentations

Turman, B. N., R. J. Tettelbach and K. B. Stevens, "The Possibility of Severe Storm Detection with Satellite Lightning Sensors," presented at the 11th Conference on Severe Local Storms, American Meteorological Society, Kansas City, MO, October 1979.

Turman, B. N., "A Survey of Lightning Channel Characteristics," presented at AF Weapons Laboratory, June 1979.

Publications

Turman, B. N., "Lightning Detection from Space," American Scientist, 67, 321, 1979.

Turman, B. N., "A Review of Satellite Lightning Experiments," Proceedings: Workshop on the Need for Lightning Observations from Space, NASA CP-2095, 1979.

Turman, B. N., "A Conceptual Lightning Locator Design for Satellite Deployment," Physics Contribution Series No. 2, USAF Academy, CO, 1978.

3. Cloud Transmission Study

Principal Investigator: Capt Bobby N. Turman, Department of Physics.

Clouds present a continuously changing attenuation for optical signals which are used for remote sensing from satellites. To estimate the effectiveness of satellite remote sensing systems, a statistical analysis of cloud attenuation is needed. This information is being collected at the Academy by continuously monitoring the solar optical power which is transmitted through clouds to the ground. After data are collected for a year, a statistical analysis of attenuation levels will be completed and applied to Air Force remote sensing systems. This project is supported by the Air Force Technical Applications Center, Patrick Air Force Base, FL.

4. Chemical Structure/Bonding Decomposition Relationships

Principal Investigator: Capt Henry L. Pugh, Jr., Department of Physics.

Associate Investigators: Dr. John S. Wilkes, Capt Larry P. Davis, 1/Lt R. Camreon Dorey of Frank J. Seiler Research Laboratory.

The operational environment of many modern weapons systems poses severe problems for the use of energetic materials as fuels or secondary explosives in these weapons systems. Explosives hung as external ordnance on high performance jet aircraft heat up due to aerodynamic drag. Some rocket fuels are stored for prolonged periods subject to temperature extremes. To cope with these and other operational problems, we are studying the thermal decomposition of TNT and the important nitramine propellants RDX and HMX. We use

the experimental tool of electron spin resonance (ESR) to monitor reactions of radical species during the decomposition process. We have demonstrated the radical kinetics of TNT, RDX, and HMX; and we are now trying to identify the specific radical reactions involved in the decomposition process.

Presentations

Henry Pugh, "ESR Studies of the Thermal Decomposition of TNT and Related Energetic Materials," 21st Annual Conference on Analytical Chemistry, Denver, on 30 July 1979.

Henry Pugh, "ESR Studies of Nitramine Propellants," Conference on Thermal Decomposition of Propellants and Explosives, USAFA on 2 August 1979.

5. Analysis of Reflection Data from Thin Film Coatings

Principal Investigator: Capt Wayne Anderson, Department of Physics.

Associate Investigator: Professor Wilford Hansen, Utah State University.

Conventional reflection spectroscopy allows identification of impurities by their characteristic absorption lines. The method lacks sensitivity when observing thin films and surfaces because of the distance the incident beam travels in the impurity saturated medium. A technique of multiple reflection spectroscopy has been developed and tested at the Naval Weapons Center, China Lake, CA, that allows an increase of sensitivity of over 100 times. This technique was used to measure approximately 50 laser window coatings provided by the Air Force Weapons Lab at Kirtland AFB. Surface impurities such as H_2O, SiO, and several hydrocarbons were identified and their concentrations calculated. The results were correlated with the film deposition technique to select the optimum deposition method.

Presentations

Wayne Anderson and Wilford Hansen, "Reflection Data from Laser Window Coatings," presented to the Air Force Weapons Laboratory, Kirtland AFB, 17 September 1979.

6. Laser Isotope Separation - Laser Economics

Principal Investigator: Capt Richard W. Davis, Department of Physics.

Associate Investigator: Dr. Mary Spaeth

Laser isotope separation of uranium has the potential of saving billions of dollars per year and extending our uranium resources by over 20% in comparison to conventional gaseous diffusion techniques. This research involves performing economic and component sensitivity analysis on various atomic vapor uranium laser isotope separation point designs. Specifically this year we are concentrating on comparing possible laser candidates such as copper vapor and rare gas halide (XeF) lasers.

Presentations

Richard Davis, "Rare Gas Halide Laser Cost and Sensitivity Analysis," presented to the Lawrence Livermore Laboratory LIS Staff, Livermore, CA, on 14 July 1979.

Publications

Davis R. W. and Layne C., "Economic Modeling and Multidimensional Sensitivity Studies," (S), Lawrence Livermore Lab LIS - Memo for Record, November 1978.

7. Acceleration of Solid Density Macro-Particles by Laser Produced Ablation

Principal Investigator: Maj Thomas E. McCann, Department of Physics.

Sponsored by Lawrence Livermore Laboratory (DOE) Livermore, CA.

The acceleration of a solid density macro-particle (0.1 - 1 gm) to velocities in excess of 10^7 cm/sec is of interest for both civil and military applications. Recent calculations performed at Lawrence Livermore Laboratories have shown that acceleration by state-of-the-art lasers of macro-particles to the desired velocities is possible. The efficiency of the laser energy to macro-particle kinetic energy is of order 10% with only a weak dependence on laser temporal pulse shape. Future computational studies will include electromagnetic means of accelerating macro-particles to high velocities.

Publications

T. E. McCann and J. S. DeGroot, "Acceleration of Macro-Particles via Laser Produced Ablation," to be published as text of an invited paper presented at the impact fusion workshop, Los Alamos, New Mexico, July 10-13, 1979.

T. E. McCann, "Accelerated Slab Phenomena" to be published as text of an invited paper presented at the impact fusion workshop, Los Alamos, New Mexico, July 10-13, 1979.

T. E. McCann, "Accelerated Slab Phenomena" to be published as text of an invited paper presented at the impact fusion workshop, Los Alamos, New Mexico, July 10-13, 1979.

8. The USAF Academy Flywheel-Electric Car

Principal Investigator: Capt Robert G. Schwein, Jr., Department of Physics.

Associate Investigators: None

An initial test of the flywheel electric car was made on 30 May 1979. Electronic control instabilities forced a test abort. At this point, it appears that the basic continuously-variable transmission and flywheel design are sound and compatible with the electrical power components. During this fall 1979 semester, a PH 499 student is working on the unstable control circuits.

Static tests on the vehicle using power from the building power lines are scheduled for completion by December 1979. Dynamic (rolling) tests with the car on battery power will begin during January through May 1980. Studies of the flywheel-electric motor efficiency will begin immediately following the dynamic tests. A minimum of five PH 499 topics will be available for the spring 1980 semester.

Publications

Ratcliff D., "The USAF Academy Flywheel-Electric Car Preliminary Design Report," FJSRL Technical Report-79-0006.

9. Characterization of Physiological Ability by Techniques of Physics

Principal Investigator: Capt John P. Jackson, Department of Physics.

A technique for measuring physiological ability is being studied by a joint project between the departments of physics and athletics. By recording data of three runs of varying distances, it is possible to compute the maximum force, friction, aerobic, and anaerobic parameters of a given runner. These parameters are used in basic equations of physics and allow prediction and evaluation of athletic performance and training.

Publications

Jackson, John P., "A Method for Measuring Athletic Potential," Aeronautics Digest, Fall 1978.

H. Education/Research Computer Center

1. Proposed DoD Computer Programming Language

Principal Investigator: 2/Lt Robert C. Siegrist.

This project studied ADA, the proposed DoD computer programming language. The project studied ADA advantages, disadvantages, and application to USAFA academics. The project studied compatibility of ADA to current USAFA academic courses by programming a standard computer exercise in ADA. The language was very adaptable, and the code was much more concise than the code from presently available languages ALGOL and COBOL.

II. GENERAL RESEARCH IN THE HUMANITIES AND SOCIAL SCIENCES

A. Department of Behavioral Sciences and Leadership

1. An Analysis of Problems Relating to Retention and Motivation at the United States Air Force Academy

Principal Investigators: Col John Williams, and Capt Mickey Dansby, Department of Behavioral Sciences and Leadership.

Unsponsored

This research involves interviews, surveys and multiple regression analysis to determine causes of retention/motivation problems at the USAF Academy, and to make specific recommendations concerning what might be done to reduce cadet attrition.

2. Pilot Performance with Peripheral Vision

Principal Investigator: Lt Col Jock C. H. Schwank, Department of Behavioral Sciences and Leadership.

Associate Investigators: Maj John Bermudez, Maj Dickie A. Harris, Capt Edwin Griggs, Department of Behavioral Sciences and Leadership.

Sponsored by Hq AMD/RDO.

To determine the extent to which a pilot can make effective use of peripheral vision in responding to flight display information. To determine the effects of stress on pilot peripheral vision. To develop and evaluate techniques for expanding a pilot's peripheral vision and to develop and evaluate techniques for effective time-sharing of peripheral and foveal flight display information.

Presentation

"Pilot Performance During Flight Simulation with Peripherally Presented Visual Signals," 22nd Annual Meeting of the Human Factors Society, 1978.

3. Improving Organizational Effectiveness in the Air Force Through Improved Management and Development of Human Resources

Principal Investigators: Lt Col William E. Rosenbach, Department of Behavioral Sciences and Leadership and Lt Col Denis D. Umstot, Office of Admissions and Registrar, Evaluation Division.

Associate Investigators: Maj Robert Nordeman, Capt Fred Harburg, Capt Robert Gregory, Capt William Clover, 2/Lt Paul Weaver, Department of Behavioral Sciences and Leadership.

Sponsored by Air Force Office of Scientific Research.

Field research in ongoing Air Force units representing cross section of skills and jobs. Purpose being to determine effectiveness of various implemented strategies for work redesign and pilot job satisfaction and motivation.

Publications

"Perceptions of Job Characteristics and Affective Work Outcomes of Men and Women." Sex Roles: A Research Journal, Vol. 5, No. 3, 1979.

"Initial Training for Job Enrichment Consultants: A Multi-Perspective View." Proceedings of The Interservice Human Resource Development Symposium, 1978.

"Relationship Between Age, Organization Structure, and Job Satisfaction for Female Workers," Southwest Academy of Management Proceedings, 1979.

Presentations

"Incentive Systems: A Comparison of Two Evaluation Techniques," 39th Annual Meeting of Academy of Management, August 1979.

"Motivational Determinants of Physician Career Decisions," 39th Annual Meeting of Academy of Management, August 1979.

4. Analysis of Soviet Behavioral Sciences

Principal Investigator: Lt Col Valentin W. Tirman, Jr., Department of Behavioral Sciences and Leadership.

Associate Investigators: Lt Col Eugene H. Galluscio, Lt Col Jefferson M. Koonce, Maj John M. Bermudez and Capt David C. Gillman, Department of Behavioral Sciences and Leadership.

Sponsored by the Defense Intelligence Agency.

Purpose of this effort is to evaluate the Soviet "state of the art" in various areas of the behavioral sciences, to include psychopharmacology, individual behavior modification, population behavior modification, and parapsychology.

5. Assessment Procedures for Stress Management Training in an Academic Setting

Principal Investigator: Maj Richard L. Hughes, Department of Behavioral Sciences and Leadership.

Associate Investigator: Capt Larry Wheeler, Department of Behavioral Sciences and Leadership.

Sponsored by Frank J. Seiler Research Laboratory (AFSC).

The evaluation of techniques for identifying and remediating test anxiety in college students. In particular, evaluate

biofeedback-based relaxation training and cognitive modification techniques. Assess treatment in terms of self-report, performance and physiological measures.

Presentations

"Electromyographic biofeedback in the Desensitization of Test Anxiety." Paper presented at the American Psychological Association, September 1979, New York City.

6. Effects of Pretraining Criterion on Secondary Cognitive Task Performance During Aircraft Flight Simulation

Principal Investigator: Maj Mark Nataupsky, Department of Behavioral Sciences and Leadership.

Associate Investigators: Lt Col Jock C. H. Schwank, Lt Col Valentin W. Tirman, Jr., Maj Ronald LaScala, Capt Edwin Griggs, Capt Carl Bryant, Capt Sharon Slaughter, Lt McKay, Lt Schmidt, and Ms. Nita Huelf, Department of Behavioral Sciences and Leadership.

Sponsored by Frank J. Seiler Research Laboratory.

To determine effects of training criterion on flight simulation research results and to determine predictive validities of study skills questionnairs.

7. An Evaluation of Male and Female Anxiety During Survival, Evasion, Resistance, and Escape (SERE) Training

Principal Investigator: Capt David C. Gillman, Department of Behavioral Sciences and Leadership.

Associate Investigators: Maj Dickie A. Harris and Lt Steven Hampton, Department of Behavioral Sciences and Leadership.

Sponsored by the Frank J. Seiler Research Laboratory.

To examine several aspects of anxiety and stress in second-year cadets participating in Survival, Evasion, Resistance and Escape (SERE) training. A continuing effort begun during the summer of 1977. A pre-test/post-test design was used to detect any changes in anxiety levels caused by SERE, and to yield valuable information about male versus female response to physically and mentally stressful experiences.

Publication

"An Evaluation of Anxiety and Stress During Combat-Oriented Survival, Resistance, and Escape (SERE) Training: A Comparison of Female and Male Air Force Academy Cadets." Frank J. Seiler Technical Report 79-0007, Air Force Systems Command, 1979.

Presentation

"Anxiety and Stress During Combat Oriented Training: A Comparison of Male and Female Air Force Academy Cadets," presented at the Western IUS Conference, May 1979.

8. Reacquisition and Maintenance of Flying Skills

Principal Investigator: Lt Col Jefferson M. Koonce, Department of Behavioral Sciences and Leadership.

Sponsored by the Air Force Office of Scientific Research.

Approximately 90 pilots have flown a comprehensive flight profile in a flight simulator and their performances were analyzed in terms of both psychomotor and cognitive skills. Initial analysis indicates a more rapid deterioration of cognitive skills than psychomotor skills as a function of length of time that the pilots refrain from flying. Data collection and analysis is continuing through FY 80.

9. Comparison of USAFA Males and Females in the Prediction of Psychomotor Skills and Performance on Basic Flight Maneuvers

Principal Investigator: Lt Col Jefferson M. Koonce, Department of Behavioral Sciences and Leadership.

Associate Investigator: Lt Col Gene A. Berry, Department of Behavioral Sciences and Leadership.

Sponsored by the Air Force Office of Scientific Research.

Fifty male and 50 female cadets were given six tests to determine whether different regression equations were necessary in order to obtain the best prediction of their performance on a psychomotor test device (PTD). The predictor tests involved

perceptual speed, short-term visual memory, spatial orientation, spatial scanning, field dependence/independence, and pursuit tracking ability, and the criterion task was a solid-state version of a stick-and-rudder task. All of the proceeding tasks were used in an attempt to predict performance of basic flight maneuvers in a flight simulator under both smooth and turbulant air conditions. This latter attempt was akin to the proposed Ground Based Screening (GBS) program developed by AFHRL for the Air Force in that the predictor tests measure cognitive factors similar to those in the AFOQT and the PTD was the one proposed in GBS. Results indicate that in the prediction of learning basic flight maneuvers, a different prediction equation should be developed for males than that for females if optimum prediction is desired. Also, rate of acquisition of a task might be a better criterion measure of subject performance than his ability on the task at a given point in time. This will be further investigated in FY 80.

10. Air Force Academy Cadet Interests in Flying Specific Aircraft

Principal Investigator: Lt Col Jefferson M. Koonce, Department of Behavioral Sciences and Leadership.

Unsponsored

The expression of a belief that Academy cadets would definitely prefer to fly fighter-attack-reconnaissance (FAR) type aircraft instead of transport-tanker-bomber (TTB) type aircraft was tested by a survey of the pilot qualified first class cadets in the Class of 1979. Although the results support the hypothesis of a preference for FAR for immediate assignment; for anticipated assignments following pilot training and for a long-term or career assignment, the cadets' desires are evenly divided between TTB and FAR.

Publication

"Air Force Academy Cadet Interest in Flying Specific Aircraft," USAF Academy, CO, Technical Report 1979.

11. Development and Validation of Ground-Based Selection Method for Pilot Training Candidates

Principal Investigator: Lt Col Jefferson M. Koonce, Department of Behavioral Sciences and Leadership.

Unsponsored

One hundred twenty-nine pilot qualifed cadets of the Class of 1978 and 286 cadets of the Class of 1979 were given the AFOQT and a psychomotor test in the spring of 1978. This revised AFOQT and psychomotor test was proposed as a system to screen candidates for pilot training. The cadets' scores on the two tests were rank-ordered, and most of the cadets have proceeded to pilot training upon completion of their Academy education and commissioning. By December 1979 the success/failure of those cadets tested from the Class of 1978 will be known and compared to their performance on the proposed selection tests. The data for the Class of 1979 will be complete by December 1980.

In the summer of 1979, 700 pilot qualified cadets in the Class of 1983 were given the psychomotor test, and the entire class was given the AFOQT. These cadets will be tracked on through pilot training as the cadets of 1978 and 1979 are being followed.

This study will validate the proposed pilot selection program for Academy cadets who have had T-41 training, for advanced cadets before they have had T-41 training, and for cadets in the initial stages of selection for the Academy. Information acquired from the initial phases of this study has led to the proposal of some alternative methods for selecting pilot training candidates. Coordination with AFHRL and developmental research at USAFA are continuing during FY 80.

B. Department of Economics, Geography and Management

1. The Gerschenkron Effect Revisited

Principal Investigators: Lt Col William J. Weida and Dr. George J. Staller, Department of Economics, Geography and Management.

Problems in the statistical development of the Gerschenkron effect are investigated and alternative explanations for the accompanying hypothesis are advanced.

Publication

USAF Academy Technical Report, forthcoming.

2. Usage Indices and Manuscript Acquisition Decisions, USAFA Library

Principal Investigator: Capt Vernon E. Francis, Department of Economics, Geography and Management.

The USAFA Library recently (July 1977) installed an automated book checkout system. This system provides monthly summary statistics showing the number of books checked out by Library of Congress classification and user type. These raw statistics, however, provide little useful information to the librarians and library staff. In fact, these aggregate numbers can even be misleading. The purpose of this research project is to develop, from the information generated from the automated checkout system, more meaningful and useful indices that can be easily interpreted by the library staff. Also, it is intended to incorporate these indices into the book buying decision process in order to most effectively allocate the library's manuscript acquisition budget.

3. Communicating Force Size and Risk

Principal Investigator: Maj Raymond E. Franck, Department of Economics, Geography and Management.

Sponsored by Hq USAF/XOXLS.

As force size decreases relative to threat, more risk is taken. The paper, which exists in draft form, proposes a definition of such risk (probability of not performing the required mission) and a simple paradigm for communicating such risk, which is called the Representative Minimum Scenario.

4. Repairing and Maintaining Forces in Combat: US vs USSR

Principal Investigators: Maj Jeffrey D. Baker and 2/Lt Vance Skarstedt, Department of Economics, Geography and Management.

Both Soviet and U. S. forces face maintenance and logistic problems that may constrain combat effectiveness. The purpose of this research is to explore the similarities and differences in the two systems. The philosophical approach to logistics and maintenance is hypothesized to be quite different, and these differences are expected to result in unique problems. Special attention is devoted to tank and aircraft problems.

5. Superpower Defense Budget Interactions

Principal Investigator: Maj Raymond E. Franck, Department of Economics, Geography and Management.

Sponsored by Frank J. Seiler Research Laboratory.

An empirical examination of superpower defense budget interrelationships for the period 1950-1978. Two sets of data are fitted, one of which is classified from CIA/OSR. Focus of study is on process changes, and the possibility of various forms of strategic behavior by the participants.

6. The Church in the Economic Environment of the '80s

Principal Investigator: Lt Col William J. Weida, Department of Economics, Geography and Management.

Changing economic conditions such as increasing energy prices, continued high inflation, etc., will have a marked effect on the way the church will be forced to conduct business in the 1980s. Affects of these influences on plant maintenance, congregation size, potential giving, and methods of outreach to congregation members are investigated.

Presentation

Presented to the Association of Church Business Administrators, 21 September 1979.

7. The Economics of Defense Resource Allocation

Principal Investigator: Maj Raymond E. Franck, Department of Economics, Geography and Management.

A monograph, with Major Gregory Hildebrandt (DFEGM), on resource allocation for defense.

8. Yeoman Regions in the Antebellum Deep South: Settlement and Economy in Northern Alabama, 1815-1860

Principal Investigator: Maj John M. Allman, Department of Economics, Geography and Management.

This is a study of economic development and social mobility problems in the Antebellum Deep South. Concepts associated with dual economy and migration theory are employed. The study will provide a unique framework for analyzing socio-economic problems in underdeveloped countries in the "third world" today. Special variables considered include: skewed demographic structures, inter-regional trade patterns, and transportation-commercial ties in frontier and/or developing regions.

Publication

PhD Dissertation, forthcoming, 1979.

9. Contemporary Reflections on an Economic Interpretation of History

Principal Investigator: Lt Col Robert L. Gustavson, Department of Economics, Geography and Management.

Throughout history, diverse forms of social organization have emerged to resolve the economic problems of allocating scarce resources to satisfy unlimited wants. Karl Marx argued that the development of social organization will occur through a process which is impelled by changes in modes of production. He observed that feudalistic and mercantilistic forms of social organization had yielded to capitalism. Capitalism, in his view, was merely an historical necessity which would provide the basis for socialistic and ultimately communistic economic systems which he considered to be more desirable social organizations. One of the most significant distinctions among the evolving forms of social organization have been balance between the private and public sectors. The emphasis upon (1) efficiency, (2) equity, (3) economic stabilization, and (4) economic growth characterizes a stage of economic development. These criteria are used to evaluate the dynamic process of social change. The objective of the paper is to place the American system within an historical perspective and provide insights into its evolutionary direction. The balance which dominates in the years ahead will substantially influence the evolutionary process the United States economy will follow.

Publication

USAF Academy Technical Report forthcoming.

10. Analyzing and Modeling Natural Disasters: Implications for Recovery from Nuclear Disasters (U). SECRET/WNINTEL/NOFORN

Principal Investigators: Maj William A. Mitchell, Lt Col William J. Weida, and 2/Lt Timothy Miner, Department of Economics, Geography and Management.

This research addresses the questions, "Can a comparison be made between recovery from a nuclear disaster and recovery from a natural disaster?" and if so, "What comparisons can be made concerning nuclear disaster recovery when natural disaster recovery is examined in the Peoples' Republic of China and the Soviet Union?" The report examines the nature of nuclear and natural disasters and identifies common recovery elements. It further models the recovery effort from several earthquakes on a temporal basis. The model is based on an S-shaped growth curve. PRC and USSR earthquakes are examined in light of the model. The report concludes with an argument for comparing the recovery from a nuclear event and recovery from various natural disasters. Insights from the examination of natural disaster recovery in the PRC and USSR are provided. Contains a significant bibliography.

Publication

USAFA-TR-79-3, USAF Academy Technical Report, April 1979.

11. Soviet Economic Efficiency (A Study of a Major Subregion, The Ukrainian Soviet Socialist Republic, the Contribution of the Ukraine to the Soviet Economic Strength)

Principal Investigator: Maj Leslie H. Kool, Department of Economics, Geography and Management.

Evaluation of the contribution of Ukraine to the efficiency of the Soviet Economy.

12. Czechoslovak Experiment in Political Economy

Principal Investigator: Maj Leslie H. Kool, Department of Economics, Geography and Management.

This is an historical evaluation of the political-economy of Czechoslovakia before, during, and just after the 1968 Prague Spring.

Publication

USAF Academy Technical Report, forthcoming, and to be used in Economics 361.

13. Specific and General Training: A Study of Air Force Academy Graduate Promotion and Attrition

Principal Investigator: Maj Jeffrey D. Baker, Department of Economics, Geography and Management.

The human capital investment process is dichotomized into general and specific training. In any period, the individual must decide on the amount and mix of schooling. The individual's decision impacts on both his future earnings and his tenure with a particular firm. A unique data set was used to test the differential impact that each training form has on earnings and job longevity. In the enhancement of earnings, the theoretical results do not favor either specific or general training. Past research has yielded a similar conclusion and has been unable to substantiate the superiority of either investment form. The data used to test the current model yield a clear earnings' differential that favors specific investments. Specific training is more important than general training on the individual's subsequent earnings. The training mix is also important to job tenure. The theoretical and empirical results yield two important conclusions. First, the sensitivity of attrition to the investment mix increases as one approaches the expected termination point of the current job. More specific investment is thus likely to extend the expected termination point as the latter is approached. Two, a larger value of human capital stock positively impacts on the relationship between the expected job tenure and the training mix. Both the timing and mix of investment activities have been found to be important variables in the earnings equation. Similarly, these considerations are crucial to job mobility. The insights provided by this research should facilitate policy makes in their understanding of the human capital investment process and assist them in policy formulation more consistent with organizational goals.

Publication

PhD Dissertation, University of North Carolina, Chapel Hill, North Carolina, May 1979.

14. Municipal Pension System Evaluation and Optimization

Principal Investigators: Lt Col F. Theodore Helmer and Shirley Olson, Department of Economics, Geography and Management.

This study looks at municipal pension systems with an in-depth analysis of the future costs of present services. Using modern operations research techniques, it helps municipal managers make better decisions about the future.

Publication

Journal of Municipal Management, Spring 1978, and Proceedings, American Institute for Decision Sciences, March 1979.

15. Environment, Disaster and Recovery: A Longitudinal Study of the 1970 Gediz Earthquake in Western Turkey

Principal Investigators: Maj William A. Mitchell and 2/Lt Timothy Miner, Department of Economics, Geography and Management.

On March 28, 1970, an earthquake of Richter magnitude 7.1 occurred near the town of Gediz in western Turkey. One thousand and eighty-six people were killed and 1,265 were injured in the disaster. The earthquake had a disastrous effect in 313 villages and towns, demolishing 14,852 homes and damaging 5,105 others. Soon after the emergency phase, the Turkish government implemented a vast relief, recovery and reconstruction program which included rebuilding the town of Gediz and building 9,009 houses throughout the damaged area. This report is a comprehensive analysis of the disaster from its beginning through the summer of 1978. It is the first longitudinal study of an earthquake disaster in Turkey.

Publication

USAFA-TR-78-11, USAF Academy Technical Report, November 1978.

16. Don't Hesitate. . . Communicate

Principal Investigators: Lt Col Robert L. Taylor and Mrs. Jean Brewer, Department of Economics, Geography and Management.

This article presents a dialogue between a boss and secretary with a focus on building a good work team. Topics discussed are getting to know each other, teamwork, communication, the

secretary as a professional, taking the initiative, and goal-setting. The authors conclude that success on the job is based upon skill, attitude, frame of mind, and working style.

Publication

The Secretary, February 1979, pp. 12, 14, 28-30.

17. In Whose Image? Church Symbols and World Views

Principal Investigator: Maj Richard Wolniewicz, Department of Economics, Geography and Management.

Landscape analysis has long been a central theme in cultural geography. Evidence suggests that man's decoration and structuring of architectural space in churches is influenced by and, in turn, influences his world view and his conception of the diety. An examination of churches from Orthodox, Catholic, Methodist, Episcopal, and Presbyterian traditions supports theologian Michael Novak's contentions that Americans of Northwest European heritage view their god as a rational, orderly sky-dweller, while those of Southeast European descent view their diety as a "work" psychologically, socially, and economically for a denomination's members. Symbols change as a congregation's characteristics change so that man's everyday experiences are reflected in his religion.

Publication

Journal of Popular Culture, October 1978.

18. Contemporary Issues in Macroeconomics: A Book of Intermediate Readings

Principal Investigator: Maj Stephen H. Russell, Department of Economics, Geography and Management.

This document is a compilation of scholarly articles on key issues within the profession of macroeconomics. Topics include inflation fighting strategies, the natural rate of unemployment, the whole issue of an activist stabilization policy, the role of monetary policy, and are categorized in the following sections: I. Fiscal Policy; II. Monetary Policy; III. Monetarism; IV. Inflation; and V. Unemployment.

Publication

DFEGM/USAFA text.

19. Observing Preferences for Educational Quality: The Weak Complementarity Approach

Principal Investigator: Maj Gregory G. Hildebrandt, Department of Economics, Geography and Management.

Associate Investigator: Timothy D. Tregarthen, University of Colorado.

This paper applies the weak complementarity approach to the problem of estimating the demand for school quality and other local public goods. Using the same data used by Oates (1969) in his classic study, a demand function for housing is estimated, from which the efficient relative levels of public goods provision are computed. The statistical problems involved in estimating a housing demand function from cross-section data are discussed.

Publication

USAFA-TR-79-6, USAF Academy Technical Report, July 1979, and Scandinavian Journal of Economics, Volume 81, No. 2, 1979, pp. 188-197.

20. The Supply and Demand for Light-Water Reactors to Less Developed Nations: Implications for Nuclear Proliferation

Principal Investigator: Lt Col Robert L. Gustavson, Department of Economics, Geography and Management.

Sponsored by the University of California, Los Alamos Scientific Laboratory.

While less developed nations appear to have limited energy alternatives conditions which have limited their economic development in the past continue to restrict their potential to use nuclear energy to enhance economic development. While the nuclear proliferation treaty promotes the widespread use of nuclear technology for peaceful purposes, economic conditions tend to indicate that horizontal dissemination of nuclear technology will proceed slowly. For those nations which are able to acquire nuclear technology, it appears that the link between acquiring nuclear reactors and nuclear weapons production may be controlled by safeguarding the enrichment and separation process.

Presentation

Western Economic Association, June 17-21, 1979.

21. The Economics of Less Developed Nation Acquisition of Light-Water Reactors with Implications for Nuclear Proliferation

Principal Investigator: Lt Col Robert L. Gustavson, Department of Economics, Geography and Management.

Sponsored by the University of California, Los Alamos Scientific Laboratory.

Basically, this article is the same as above, except that this report is more theoretically oriented and had much stronger policy recommendations.

22. Perceptions of Interim and Long-Term Alternatives for School District Number Twenty

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Associate Investigator: Ms. Janet Johnston and Mr. Mark Kinna.

Sponsored by School District Number Twenty.

A comprehensive survey of attitudes and perceptions of residents in the Air Academy School District on alternatives to school overcrowding was conducted in March-April 1979. Nearly half of the 5,200 households in the district responded with a variety of opinions on year-round schools, split sessions, and a bond issue referendum for new school construction.

Presentation

District Twenty Board, Administration Board Room, USAF Academy, Colorado, 6 March 1979.

23. Colorado Springs in the 1990s--A Scenario Generation

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Associate Investigators: Barbara Hook, George Karius, Robert Lewis, Mary Ellen McNally, Nancy Schrag, Betty Spencer.

Seven prominent citizens from the City of Colorado Springs developed a scenario generation exercise to provide a forecast of the education needs in the next 12 to 15 years. The economic, political, social, technological, and ecological environments are forecast with the summary providing specific implications for education.

Presentation

Colorado Springs School Board, Colorado Springs, Colorado, March 1979.

Publication

USAFA-TN-79-3, USAF Academy Technical Note, March 1979.

24. Case Study of Information Gathering for Policy Decisions in Public Schools

Principal Investigators: Lt Col Robert L. Taylor and Lt Col F. Theodore Helmer, Department of Economics, Geography and Management.

Sponsored by Colorado School District Number Twenty.

School administrators often find themselves responding to the voices of small, but vocal, interest groups that do not represent the needs and perceptions of the constituency. In this study, a comprehensive survey of client-systems in a medium-sized public school district is reported, with emphasis on how data on perceptions and needs can be gathered. The study shows how the data were used to influence policy decisions, and clearly defines the obligation that decision makers have for making better informed and responsive decisions in the public sector.

Presentation

School Board, USAF Academy, Colorado, May 1978.

Publication

The Journal of Educational Research 72:1 (September-October 1978), pp. 23-28.

25. Work Attitude Study of Teachers in a Public School System

Principal Investigators: Lt Col Robert L. Taylor, Department of Economics, Geography and Management; Lt Col W. E. Rosenbach and Maj R. W. Nordeman, Department of Behavioral Sciences and Leadership.

Sponsored by Colorado School District Number Twenty.

A total of 256 teachers and staff members of a single school district participated in a survey of their attitude toward the job, supervision, and the organization. Teachers generally had a significantly higher satisfaction with all aspects of their job than do professionals representing some 3,000 studies from throughout the United States. Measures varied between schools, related to satisfaction with supervisor and job autonomy. This is a premiere study using the Job Diagnostic Survey and Organization Climate Survey with public school teachers.

Presentation

School District Twenty School Board, USAF Academy, Colorado, May 1979.

Publication

Forthcoming.

26. Market Warfare: A Contribution to the Theory of Economic Diplomacy

Principal Investigator: Maj Stuart C. Kirk, Department of Economics, Geography and Management.

Over the past few years the association between national economic policy and national security has become increasingly obvious. The Arab oil actions of 1973 demonstrated that international economic interdependence can also lead to national economic vulnerability. This research precisely defines the concept of economic warfare and develops a generalized framework to determine under what circumstances one nation has economic power or is economically vulnerable to actions of other nations. Both oil and wheat power are treated.

Publication

PhD Dissertation, forthcoming.

Presentation

USAFA-Rand Conference, USAF Academy, Colorado, August 1979.

27. The Size and the Burden of Soviet Defense: Implications of International Comparability

Principal Investigators: Maj Raymond E. Franck and Maj Gregory G. Hildebrandt, Department of Economics, Geography and Management.

This paper is a brief discussion of the implications of such comparative measures of defense efforts as the CIA dollar cost estimates of Soviet defense. Under the assumptions that defense can be measured ordinally and that both parties measure defense capabilities the same way, it is shown that the true ratio of U. S. defense effort to Soviet defense effort is bounded by the ratio of the U. S. budget and the dollar cost of duplicating the Soviet effort from below, and the ratio of Soviet ruble duplication cost of the U. S. effort and the Soviet defense budget from above.

Publication

USAFA-TN-79-6, USAF Academy Technical Note, August 1979.

28. Trip Distribution of General Aviation

Principal Investigator: Lt Col Earl F. Saunders, Department of Economics, Geography and Management.

General aviation accounts for 98% of the registered aircraft in the U. S. and approximately 50% of all air travel (passenger miles flown). Little research has been done on the trip behavior of general aviation primarily due to a lack of data. This study is directed at the evaluation of trip behavior of general aviation in the Great Lakes Region. A modified intervening opportunities model is used to predict inter-station travel.

Publication

PhD Dissertation, forthcoming.

29. Top Management Workshop

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

This two-day workshop for police captains and lieutenants covered motivation, communication, management style, and team building for law enforcement managers.

Presentation

Presented to the police chiefs and captains, Utah Peace Officer Standards and Training, Salt Lake City, Utah, October 1978.

30. Management Challenges of the '80s

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Building a work team, group dynamics, leadership styles, communication and motivation were integrated into a series of exercises, cases, films, and discussions in a one-day workshop for junior officers.

Presentation

To junior officers, USAF Academy, Colorado, November 1978.

31. Management Workshop for Dentists

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Management style, communication, motivation, and group climate are highlighted in a one-day session with discussions, experiential exercises, and film cases.

Presentation

Presented at the USAF Academy, Colorado, November 1978 and January 1979.

32. Doing Your Best

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

A one-day workshop for secretaries focused on time management, building a work team, and developing a personal self-image. Secretaries and their bosses participated in this dynamic, technique-oriented experience.

Presentation

A management workshop for secretaries, USAF Academy, Colorado, February 1979.

33. Time Management

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

This one-day seminar included cases, films, and experiential exercises to help top managers use their time more effectively through planning and delegating.

Presentation

Presented to top managers, "SUPERMAN" group, Tinker AFB, Oklahoma, March 1979; Federally Employed Women, Colorado Springs, Colorado, May 1979.

34. Communication and Motivation--Your Two Most Important Tools

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

A full-day workshop employed discussions, films, and case studies for helping managers to be more effective in motivating and communicating with their subordinates.

Presentation

Federal Women's Program, Ft. Belvoir, Virginia, April 1979.

35. Communication, Building a Work Team, Performance Control, and Management Styles

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

A one-day workshop covering the topics highlighted the management problems of medical food service supervisors in the Air Force.

Presentation

1979 Air Force Dietitians Workshop, Brooks AFB, Texas, April 1979.

36. Motivation

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

This keynote presentation presented a powerful set of tools for managers to use in motivating their subordinates.

Presentation

Rocky Mountain Consumer Credit Conference, Denver, Colorado, May 1979.

37. The Blue Tube

Principal Investigators: Lt Col Robert L. Taylor, Department of Economics, Geography and Management; Lt Col William Wallisch, Department of English.

A multi-disciplinary approach to teaching English and marketing uses television as a medium for learning. The process of how the programs were established and the effectiveness of student-produced programs are discussed in a highly-readable exposition of an innovative pedagogical tool.

Publication

Educational and Industrial TV, forthcoming.

38. Public Sector Management

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Critiques of management research in public sector organizations reveal that, all too often, researchers fail to address the needs of practicing managers. Including theory with realism is possible with more careful research.

Presentation

Academy of Management National Meeting, Atlanta, GA, August 1979.

39. Colorado Air National Guard Deploys to NATOs Southern Flank: A Case Study in Geographic Education

Principal Investigator: Maj William A. Mitchell, Department of Economics, Geography and Management.

Sponsored by the Air National Guard.

About 600 Colorado Air National Guard members recently deployed to Turkey on a NATO flying training mission. The USAF Academy was charged with developing and presenting them with a multi-disciplinary program in geography, language, history, and political science. A three-month indoctrination course emphasized a physical and human geography of Turkey, concentrating on rural and urban problems, an introduction to the language, Islamic influences, historical perspectives, and terrorism. Academic objectives stressed both knowledge and developing positive attitudes. The author deployed with the unit and respective student's application of their knowledge and attitude. This program is recommended for all future international deployments.

Publication

Air Command and Staff College Research Report and as a USAF Academy Technical Report, forthcoming.

Publication

Air Command and Staff College Research Report and as a USAF Academy Technical Report, forthcoming.

40. US-PRC Trade and the Transfer of Weapons Technology

Principal Investigator: Maj Russell T. Reston, Department of Economics, Geography and Management.

This paper argues that an expansion of US-PRC trade will not result in a massive flow of weapons technology to the PRC because of certain economic, political, legal, and technical constraints which inhibit PRC acquisition and absorption of western weapons technology.

Presentation

21st Annual Conference of the Western Social Science Association, Lake Tahoe, Nevada, 27 April 1979.

41. A Discriminant Analysis of the Factors Affecting Migration Changes in Nonmetropolitan Counties in Georgia, 1960-1975

Principal Investigator: Capt Melvin N. Johnson, Department of Economics, Geography and Management.

Economic activities are generally attracted to metropolitan areas because of economies of agglomeration which accompany concentration; people are generally drawn into the same areas because they offer improved incomes and a diversity of lifestyles. Recent changes have apparently tended to offset these urbanization trends, at least in many areas. To date, the distinguishing characteristics of growing as opposed to stable or declining nonmetropolitan communities have not been clearly identified. Therefore, the objectives of this thesis are to: (1) Utilize a discriminant function analysis to identify those characteristics of the growing nonmetropolitan areas in Georgia and to account for the reversal of migration into these areas during the 1970-1975 period. (2) Give special study to the counties in Georgia which were previously designated as depressed areas but experienced growth turnaround during the 1970-1975 period and attempt to explain the growth reversal as compared to the previous decade. (3) Attempt to determine what role, if any, public policies played in the migration reversals.

Publication

PhD Dissertation, forthcoming.

C. Department of English

1. Alexander Pope's Moralizing Taste: A Study of Values Informing His *Epistle to Burlington*

Principal Investigator: Capt James R. Aubrey, Department of English.

Sponsored by Air Force Institute of Technology.

Doctoral Dissertation (University of Washington) on the importance of moral considerations to Pope's attitudes toward painting, architecture, and gardening.

Publication

PhD Dissertation, forthcoming.

2. Computer-Assisted Inquiry

Principal Investigator: Capt Hugh L. Burns, Department of English.

Sponsored by individual.

Summary of the doctoral research at the University of Texas--Stimulating Rhetorical Invention in English Composition Through Computer-assisted Instruction. This article emphasizes how the computer may serve the humanist as a tool for successful inquiry.

Publication

Article is designed to appear in Educational Technology.

3. The Future of Instructional Computing in the Humanities

Principal Investigator: Capt Hugh L. Burns, Department of English.

Sponsored by the National Educational Computing Conference (NECC).

This paper and presentation discuss the concept of open-ended programming in the humanities--programs which anticipate responses but cannot understand specific remarks. These programs stimulate inquiry, prompt critical analysis, and encourage expression of ideas.

Publication

January 1980--paper; June 1980--presentation.

4. Stimulating Invention through CAI

Principal Investigator: Capt Hugh L. Burns, Department of English.

Sponsored by the University of Texas at Austin and NCTE.

The University of Texas has nominated the research to the NCTE as the "outstanding research in English education for 1979-1980." Article emphasizes the different "heuristic" powers of the classical topoi, the dramatistic pentad, and the tagmemic matrix.

Publication

A Research in the Teaching of English (RTE) article due next spring for consideration. (Selection by the NCTE research committee.)

5. Teaching Heroism at the U. S. Air Force Academy

Principal Investigator: Capt Edwin F. Cummings, Jr., Department of English.

Sponsored by individual.

A discussion of the spring 1979 English 495 "The Soldier as Hero/Anti-Hero" and its relationship to (1) the Academy course of (core) study; (2) relevance of such study; (3) whether the possibility of heroism--or at least professionalism (in the largest sense of that word)--increases or decreases after such study.

Publication

Author will submit article to Air University Review.

6. The Confession: Wally Wanderon and Joel Chandler Harris

Principal Investigator: Capt Bruce Degi, Department of English.

Sponsored by individual.

His last (and worst) book, Wally Wanderon and His Story Telling Machine, is nonetheless an important insight into the literary career of J. C. Harris. Through a thinly disguised framework, Harris "confesses" to his reasons for writing, his value as an author, and his love for the "good old days."

Publication

Author will submit to such publications as Folklore and Southwestern Literature.

7. Pickup Games: The Basketball Myth in *Going After Cacciato*

Principal Investigator: Capt Bruce Degi, Department of English.

Sponsored by individual.

A study of the use of basketball as a metaphor in Going After Cacciato. This is not "basketball and Vietnam are both wars"; rather, it will be a look at the essential myth of basketball--for instance the importance of deception--and how that myth works in the novel.

Publication

Unknown at this time.

8. Computer-Assisted Instruction (CAI) Software Development in Composition

Principal Investigators: Capt Leo Finkelstein, Jr., and Capt Hugh L. Burns, Department of English.

Sponsored by individuals.

Develop, program, and test a series of CAI modules in advanced BASIC which supplement classroom or home study in invention, disposition, and elocution.

Publication

Possible markets include Tandy, Inc., and Computer Software.

9. Pilgrimage: James Dickey at the Air Force Academy

Principal Investigator: Lt Col James C. Gaston, Department of English.

Sponsored by individual.

A multi-media presentation using Dickey's visit as an occasion to examine the importance of Air Force tradition at the Academy.

Publication

For use in various USAFA briefings and convocations.

10. Cleanth Brooks at the United States Air Force Academy

Principal Investigator: Lt Col James A. Grimshaw, Jr., Department of English.

Sponsored by DFENG and individual.

A transcript of Brooks' two-day visit (April 1978) at USAFA including his remarks to English classes, the faculty, and the Cadet Wing, the last of which was the Distinguished Speakers' Program entitled "The Purpose and Use of the Humanities."

Publication

Author will publish at USAFA as a monograph.

11. Flannery O'Connor Companion

Principal Investigator: Lt Col James A Grimshaw, Jr., Department of English.

Sponsored by individual.

A critical introduction to the short fiction and novels of Flannery O'Connor, this volume in the Greenwood companion series also will include a catalog of the characters which appear in O'Connor's writing.

Publication

Author will submit to Greenwood Press.

12. Robert Penn Warren's "Henriad" in *All the King's Men*

Principal Investigator: Lt Col James A. Grimshaw, Jr., Department of English.

Sponsored by individual.

This article develops the parallels between Shakespeare's "Henriad"--Richard II, 1 Henry IV, 2 Henry IV, and Henry V--and Warren's All the King's Men and illustrates the influence of Shakespeare on Warren through the political machinations of Willie Stark, the principal figure in ATKM.

Publication

Author will submit article to the Southern Review (Fall 80).

13. Angry She Rode

Principal Investigator: Capt Fannalou Guggisberg, Department of English.

Sponsored by individual.

A 250-page western with a female lead--highly plotted.

Publication

Author is considering entering it in Bantam's First Western Novel Contest. Also, the editor of Ace Books wants to see it when finished.

14. Let's Play String

Principal Investigator: Capt Fannalou Guggisberg, Department of English; illustrated by Gilbert Saiz, Audiovisual Services.

Sponsored by individuals.

A children's word and picture book about a playful kitten.

Publication

The text and sample illustrations are currently under review at Parents Magazine Press.

15. Wild Bill Shakespeare Rides Again

Principal Investigator: Capt Fannalou Guggisberg, Department of English.

Sponsored by individual.

A parody of western cliches and Shakespeare's play, King Lear.

Publication

Sent to New Mexico Humanities Review for publication consideration.

16. Simplifying Electrical Prop Design: A Problem-Solving Casebook in Designing and Building a Portable Statuette with Flashing Lights

Principal Investigator: Capt Raymond C. Harlan, Department of English.

Sponsored by individual.

An article describing in laymen's terms the process of designing and building an electrical prop for a particular play. The case is considered as an illustration of how a sound design can be aesthetic and still feasible for construction by untrained volunteers.

Publication

Under consideration by Theatre Crafts.

17. Exile's and Establishmentarians: A Biographical Study of Malcolm Cowley

Principal Investigator: Capt James M. Kempf, Department of English.

Sponsored by individual.

A historical study of modern American and European art and Malcolm Cowley's role in that history.

Publication

PhD Dissertation, forthcoming.

18. The Andre Story in American Literature through Melville's *Billy Budd*

Principal Investigator: Capt Perry D. Luckett, Department of English.

Sponsored by individual.

A monograph tracing author's use of the Andre story from William Dunlap's Andre through Cooper's The Spy to Melville's Billy Budd. Fascination with the story suggests an ambivalence about the legality and "rightness" of the American revolutionary experience.

Publication

To be finished by June-July 1980 for the University of North Carolina Press. (Not a contract--Press has simply showed interest.)

19. A Bibliography of 18th Century Editions at USAFA

Principal Investigator: Capt Perry D. Luckett (co-compiler with Capt Jennings Mace and Capt James Aubrey), Department of English.

Sponsored by individuals.

A pamphlet-length descriptive bibliography of 18th Century editions in the USAFA library--a reference tool for scholars/researchers.

Publication

Authors will present pamphlet and briefing at the South Central Society for 18th Century Studies Conference, meeting March 6-8, 1980, at the University of New Mexico.

20. An Explication of Emily Dickinson's "My Life Closed Twice"

Principal Investigator: Capt Perry D. Luckett, Department of English.

Sponsored by individual.

A note on Dickinson's poem, stressing the interplay of rhetorical and poetic elements (word choice, syntax, punctuation, metrical stress, and stanzaic form) in deciphering its meaning.

Publication

Under consideration by The Explicator.

21. Maxwell Anderson's *High Tor* and James Finimore Cooper's *The Pioneers*: Some Parallels

Principal Investigator: Capt Perry D. Luckett, Department of English.

Sponsored by individual (by request of the North Dakota Quarterly).

An article tracing simularities in theme and character between Anderson's verse drama, High Tor, and Cooper's novel, The Pioneers. Critics have drawn parallels between Tor and Elizabethan literature (specifically, The Tempest); this article helps to show that Anderson's "roots" are more often American and that he constantly drew from native legend and literature for particular plays.

Publication

Article will be submitted by 1 January for consideration for publication by the North Dakota Quarterly in fall or winter 1960 issue.

22. Maxwell Anderson's *Scientific Skepticism* and Political Drama through Barefoot in Athens

Principal Investigator: Capt Perry D. Luckett, Department of English.

Sponsored by individual.

An article demonstrating the skeptical basis of Anderson's thought (previously considered romantic or pessimistic) in his early critical pieces, and then extrapolating to changes in political stances from Gods of the Lighting (1928) through Both Your Houses (1933) to Barefoot in Athens (1951). Tries to establish the modernity of the playwright's attitudes, heretofore considered somehow out of touch with modern realities.

Publication

For consideration by Modern Drama and/or Theatre Journal in 1961.

23. The Mind and Matter of Maxwell Anderson

Principal Investigator: Capt Perry D. Luckett, Department of English.

Sponsored by the University of Georgia Press and South Atlantic Modern Language Association (SAMLA).

Book-length study of the playwright's thought as it developed from his earliest poems and essays through the final works of the 1950s. Establishes Anderson's skeptical approach to experience, which caused him to continually redefine and analyze major elements of modern life.

Publication

Deadline 1 January. Will be considered with other MSS. for publication by University of Georgia Press.

24. In the Business World and in Academe: The English Teacher in the 1980s

Principal Investigator: Maj William E. McCarron, Department of English.

Sponsored by individual.

An article speculating on the development of technical writing and literature teaching in the 1980s. Article examines what the business world demands in the way of clear writing. Finally, the article suggests ways in which composition teachers and literary mandarins can come together and become, once again, English teachers.

Publication

Under consideration by College English.

25. Listening

Principal Investigator: Capt Rayolyn McKelvy, Department of English.

Sponsored by DFENG.

I hope to demonstrate a need exists here at USAFA to teach listening comprehension skills. I have already tested 70 sophomores on the Dun and Bradstreet listening Test. I'll follow up by testing these same students on the Brown-Carlson test.

Publication

None is currently planned.

26. The Joy of Clear Writing

Principal Investigator: Maj Thomas A. Murawski, Department of English.

Sponsored by USAF.

Tips on writing to appear in base newspapers.

Publication

Depends on newspaper space available and support from Air Staff.

27. Speaking Order Effects on Intercollegiate Forensics

Principal Investigator: Capt *William Newmiller*, *Department* of English.

Sponsored by the USAF Academy.

Speaking order effects, first researched by Knower in 1940, remain an area of practical concern for those involved with forensics contests. This study will subject data from the National Individual Events Tournament to sophisticated statistical examination to determine if any relationships exists between speaking order and contest outcome.

Publication

Author will submit article to Communication Monographs or the Journal of the American Forensics Association.

28. An Experimental Comparison of Televised Instructional Materials with Existing Educational Methods in the United States Air Force Air Command and Staff College Associate Seminar Program

Principal Investigator: Capt James S. O'Rourke, Department of English.

Sponsored by individual.

This experimental comparison seeks to measure the statistical significance of differences observed in group mean test scores in the ACSC Associate Seminar Program. Experimental group students have been exposed to newly-devised videotaped instructional materials, while control group students have been exposed to conventional materials only. At issue here is the measurable impact and educational value of telemediated lesson elements.

Publication

PhD Dissertation, forthcoming. Institution: S. I. Newhouse School of Public Communication, Syracuse University, Syracuse, New York.

29. Machinery and Meaning: The Achievement of Richard McKenna

Principal Investigator: Lt Commander Robert Shenk, Department of English.

Sponsored by DFENG.

Richard McKenna was a deeply serious and philosophical writer, who used his vocation of engineering as a glass with which to view political and social events, and the meaning of individual human lives seen as a whole. McKenna is also surprisingly successful in making analogies between machinery and human values; hence, his work serves as an excellent interface between technology and the humanities.

Publication

Articles from this work will be submitted to journals like Contemporary Literature and The Georgia Review; the whole study will be submitted to a university press.

30. The Practical Researcher

Principal Investigator: Col J. M. Shuttleworth, Department of English.

Sponsored by individual.

The book will guide beginning students through the research and writing process. It includes several practical suggestions for students at various levels of ability.

Publication

This book will be published by Holt, Rinehart and Winston in 1980.

31. John Donne and the Herbert Family

Principal Investigator: Col J. M. Shuttleworth, Department of English.

Sponsored by individual.

This research aims at a monograph-length study of the relationship between John Donne and the various members of the Herbert family--Edward, George, Henry and their mother, Lady Danvers. Currently available studies of these literary figures have ignored significant evidence suggesting the relationship was more profound, the influence more significant than hitherto believed.

Publication

Tentative acceptance by National Library of Wales Journal.

32. Melville and Leadership: The First Three Novels

Principal Investigator: Lt Col V. L. Thacker, Department of English.

Sponsored by individual.

An article which shows Melville's concerns with the nature of leadership and which, consequently, counters his reputation as a rebellious and anti-authoritarian writer.

Publication

No date set.

D. Department of Foreign Languages

1. Computer-Supplemented Structural Drill Practice Versus Computer-Supplemented Semantic Drill Practice by Beginning College German Students: A Comparative Experiment

Principal Investigator: Maj Reiner H. Schaeffer, Department of Foreign Languages.

Sponsored by the USAF Academy.

This study investigated the effectiveness of two types of computer practice, structural and semantic, across two levels of verbal aptitude. The experiment was conducted at USAFA with beginning German students who had had no previous language training. Subjects were randomly assigned to three groups: (1) Structural Practice, (2) Semantic Practice, and (3) No Practice (Control). Groups 1 and 2 practiced the same grammatical concept on the computer with structural and semantic exercises, respectively. After the practice session, all three groups were administered a 40-item post-test consisting of a structural and a semantic measure. Analysis of the data revealed a statistically significant difference between the structural group and the semantic group on the semantic measure ($p < .05$). The results of the study support previous research on the importance of meaningful (semantic) practice in the second-language learning process. The findings further suggest that the advantages of meaningful language practice are evidently independent of interpersonal interactions.

2. The Computer Managed Instruction of Foreign Languages at the Air Force Academy

Principal Investigators: Maj A. Allen Rowe, Department of Foreign Languages, Capt Michael D. Bush, AFIT PhD student, Ohio State University.

Sponsored by the USAF Academy.

This ongoing project has been in a phase of transition and expansion since late spring 1979 when the faculty began converting to an improved system of evaluating computerized answer sheets. The keystone program for the evaluation of graded reviews, finals and placement/validation exams has been updated to be compatible with the new input format and has been improved in the process. Previously this program provided exam results by student and by examination part in the form of order of merit, alphabetical, and section listings as well as overall and section means and standard

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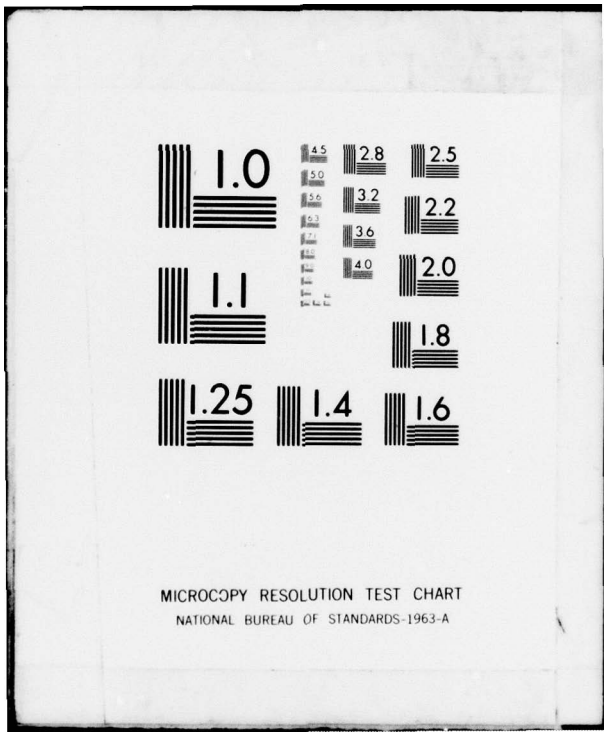
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deviations by part and by total score. To this has been added the option of having printed out along with the exam results each cadet's Academic Composite, placement/validation score and index of predicted success in the course. A Statistical Package for the Social Sciences program has been adopted to evaluate the internal consistency of our examinations. Three programs remain to be modified to interface with the new input format. Prior to the beginning of the spring semester 1980 the item analysis, midsemester special order of merit and final special order of merit programs should be functioning once again and thus providing improved tools for the analysis of student performance as well as of teaching and testing techniques and procedures.

3. The Future of Word Processing (WP), Computer Assisted Instruction (CAI), and Computer Managed Instruction (CMI) in the Teaching of Foreign Languages at the USAF Academy

Principal Investigator: Maj A. Allen Rowe, Department of Foreign Languages.

Sponsored by the USAF Academy.

The goal is to determine the potential of WP, CAI and CMI for teaching, testing, and course administration in Arabic, Chinese, French, German, Japanese, Russian, and Spanish so as to prepare the way for progressively increasing the application of computer technology to the Foreign Language courses at the USAF Academy.

4. The Effects of a Contextual Visual on Recall Measures of Listening Comprehension in Beginning College German

Principal Investigator: Capt Gunther A. Mueller, Department of Foreign Languages.

Sponsored by the USAF Academy.

The purpose of this research was to determine the extent to which seeing a visual depicting elements from a listening comprehension passage affected comprehension of that passage. Beginning and accelerated German language students were used in this experiment. The results suggest that a contextual visual is helpful to the extent that students are unable to construct context from the verbal cues. While the accelerated students were able to construct a context from the verbal cues, the basic students used the visual which appears to have increased their comprehension. Thus, the

effects of contextual visuals on listening comprehension are inversely related to the student level of language proficiency.

E. Department of History

1. A History of the United States Air Force

Principal Investigator: Col Alfred F. Hurley, Department of History.

Sponsored by the USAF Academy and the John S. Guggenheim Foundation.

Research and writing on the development of the Air Force as an institution with emphasis on its origins from 1890 to 1947. Makes use of primary sources among records of the Air Force and its predecessors, Air Force Archives at Maxwell AFB, National Archives in Washington, D. C., and papers of such founders as Foulois, Mitchell, Spaatz, and Arnold. Results to be published in a book by Macmillan Company for its series on Wars and Military Institutions of the United States.

2. USAFA Oral History Program

Principal Investigators: Maj John E. Norvell, Maj Russell W. Mank, Jr., Capt Phillip S. Meilinger, Department of History.

Sponsored by the USAF Academy.

Beginning early in 1979 as a special part of the Academy's 25th Anniversary observance, the Department of History's Oral History program conducted interviews with many of the key individuals who have played an important role in the history of this institution. Under the direction of Captain Phillip S. Meilinger, and later Major John E. Norvell, the interviews have continued throughout this anniversary year.

In April, Major General Robert W. Strong, Lt General Walter T. Galligan, and Major General Henry R. Sullivan, Jr., all former Commandants of Cadets, were interviewed. Continuing in June, Brigadier General Robin Olds, former Commandant, was interviewed at his home in Steamboat Springs by Captain Meilinger and Major Russell W. Mank. Most recently in September, Major Mank traveled to Mercer Island, Washington, to interview Brigadier General Donald A. Zimmerman, the first Dean of the faculty,

and to Washington, D. C. to interview former Commandant of Cadets, General Louis T. Seith.

The 25th Anniversary gave the oral history program a special opportunity to examine and document early Academy history. The program however, has not been limited to former Deans and Commandants. Former Superintendents such as Lt General James E. Briggs and Lt General James R. Allen have also been interviewed as well as important members of the athletic department, staff, and faculty. Work conducted during the Anniversary year totaled 25 interviews.

3. The Harmon Memorial Lectures in Military History

Principal Investigators: Capt Phillip S. Meilinger and Maj David A. Tretler, Department of History.

Sponsored by the USAF Academy and the Association of Graduates.

The first 21 annual lectures in the series have been published separately. Plans call for the publication in the future of a volume containing all lectures to the date of publication.

4. On the Threshold of Tradition

Principal Investigators: Col Philip D. Caine and Maj Harry R. Borowski, Department of History.

Sponsored by the USAF Academy.

Research on this project provided the basis for the USAFA 25th Anniversary film with the above title. Prints of the film will be distributed AF-wide and will be used for public information and recruiting.

5. Economic Development and Foreign Trade in the People's Republic of China, 1949-1958

Principal Investigator: Capt Charles L. Aldrich, Department of History.

Sponsored by the USAF Academy.

This paper analyzed and traced the evolution of economic progress and foreign commerce in the People's Republic of China from the revolution in 1949 to 1958 and was presented to the Western Social Science Association.

6. General James H. Doolittle

Principal Investigator: Lt Col Donald R. Baucom, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of James H. Doolittle, to be published in a forthcoming volume, Dictionary of American Military Biography.

7. Commitment to Excellence

Principal Investigator: Maj Harry R. Borowski, Department of History.

Sponsored by the USAF Academy.

Research efforts culminated in a short history of the Academy's first 25 years, featuring the development of the Academy's mission and major changes of the first 25 years. The history was used by the Academy during its anniversary celebration and also appeared in "The Retired Officer."

8. Curtis L. LeMay

Principal Investigator: Maj Harry R. Borowski, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of General Curtis L. LeMay, to be published in a forthcoming volume, Dictionary of American Military Biography.

9. Air Force Atomic Capability from V-J Day to the Berlin Blockade--Potential or Real?

Principal Investigator: Maj Harry R. Borowski, Department of History.

Sponsored by the USAF Academy.

This paper, presented to the 1978 meeting of the Missouri Valley History Conference, was refined and accepted for publication by "Military Affairs."

10. The American Military Establishment and the Creation of a Postwar Overseas Military Base Network, 1942-1948

Principal Investigator: Maj Elliott V. Converse, III, Department of History.

Sponsored by the USAF Academy.

The research is for a doctoral dissertation that examines the planning by various sectors of the United States military establishment for an extensive postwar overseas base system and the military's efforts to have these plans implemented following World War II. The emphasis is on an analysis of the adaptation of plans to changing forces and circumstances.

11. Office of Joint Committee Affairs

Principal Investigator: Capt Richard E. Downes, Department of History.

Sponsored by U. S. Southern Command.

Research for staff work on the implementation of the Panama Canal Treaty to take effect 1 October 1979.

12. Jacob Leisler

Principal Investigator: Maj Roger Fosdick, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of Jacob Leisler, to be published in a forthcoming volume, Dictionary of American Military Biography.

13. Frank M. Andrews

Principal Investigator: Capt Dennis G. Hall, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of General Frank M. Andrews, to be published in a forthcoming volume, Dictionary of American Military Biography.

14. Timothy Walker and the Growth of American Law

Principal Investigator: Capt Walter T. Hitchcock, Department of History.

Sponsored by Air Force Institute of Technology.

A biography of Timothy Walker (1802-1856), noted legal author, educator, reformer and jurist. Walker, who practiced law in Cincinnati, Ohio, founded the University of Cincinnati Law School in 1833, edited the Western Law Journal, and authored a legal textbook entitled Introduction to American Law which was commonly regarded as the "American Blackstone." This study documents Walker's efforts to elaborate and implement a clear, authoritative national system of law that accommodated English common law to the spirit and condition of the western frontier.

15. Serving Two Professions: History at the Air Force Academy

Principal Investigators: Col Alfred F. Hurley and Capt Donald M. Bishop, Department of History.

Sponsored by the USAF Academy.

Research focused on the teaching of history during the Academy's first 25 years. A technical report by the same title is in press.

16. Billy Mitchell

Principal Investigator: Col Alfred F. Hurley, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of General Billy Mitchell, to be published in a forthcoming volume, Dictionary of American Military Biography.

17. The USAFA Oral History Program

Principal Investigator: Maj Russell W. Mank, Jr., Department of History.

Sponsored by the USAFA Academy.

Presentation made to Colorado Center for Oral History.

18. Walter Reed

Principal Investigator: Maj John E. Norvell, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of Major Walter Reed for Dictionary of American Military Biography.

19. The Role of the Colorado National Guard in Civil Disturbances

Principal Investigator: Maj Alan M. Osur, Department of History.

Sponsored by the USAF Academy.

Efforts looked at the specific role of the Colorado National Guard in handling civil disturbances within the state of Colorado. From Sand Creek to the Colorado Coal War, the Guard was freely used and became the center of much controversy. This investigation discussed topics such as: how political was the Guard, was there sufficient control over its use of violence, was it efficiently used, what were its legal bounds and did it stay within these bounds, and how did it change with the times? Research will result in a paper to the Colorado History Group and an article.

20. Bibliographical Essay on French Defense Policy

Principal Investigator: Capt Lester G. Pittman, Department of History.

Sponsored by the USAF Academy.

Research essay will appear in Comparative Defense Policy, 2nd Edition; a textbook prepared by the USAFA Department of Political Science.

21. The Military District: Transition from Peace to War

Principal Investigator: Lt Col Carl Reddel, Department of History.

Sponsored by the Air Staff Deputy Directorate for Long Range Planning and DoD Net Assessment.

Research was presented at a conference on Soviet Military Manpower: The Military District Model.

22. General Hoyt Vandenberg, Sr.

Principal Investigator: Lt Col Jon A. Reynolds, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of General Hoyt Vandenberg, to be published in a forthcoming volume, Dictionary of American Military Biography.

23. General Hoyt Vandenberg, Sr.

Principal Investigator: Lt Col Jon A. Reynolds, Department of History.

Sponsored by the USAF Academy.

Research has concentrated on the early career of General Vandenberg, from his graduation at West Point in 1923 to the end of World War II when he was Commander of 9th Air Force. Research has been conducted in the Library of Congress, the National Archives, and the Air Force Archives (Maxwell AFB). Personal interviews with General Vandenberg's contemporaries have also been conducted.

24. The Air Corps, the Navy, and Coast Defense 1919-1941

Principal Investigator: Maj John F. Shiner, Department of History.

Sponsored by the USAF Academy.

Post-doctoral research was included in this paper to be given at Northern Great Plains History Conference.

25. General Benjamin Foulois

Principal Investigator: Maj John F. Shiner, Department of History.

Sponsored by the USAF Academy.

Biographical article of General Benjamin Foulois appeared in Air Force Magazine.

26. General Benjamin Foulois

Principal Investigator: Maj John F. Shiner, Department of History.

Sponsored by the USAF Academy.

Research resulted in a 1500-word biographical sketch of General Benjamin Foulois to be published in a forthcoming volume, Dictionary of American Military Biography.

27. Leadership

Principal Investigator: Maj John F. Shiner, Department of History.

Sponsored by the USAF Academy.

Research efforts were presented at a meeting of the USAF Academy National Defense Colloquium.

28. The Career of the Reichswehr Officer

Principal Investigator: Maj David N. Spires, Department of History.

Sponsored by the USAF Academy.

Analysis of the Reichswehr, Germany's Army during the Weimar Republic, in terms of its unique professional military nature. Special emphasis is placed on officer education, training, and career opportunities and their impact during the Weimar Republic and the Third Reich.

29. Post-Doctoral Research on the Reichswehr

Principal Investigator: Maj David N. Spires, Department of History.

Sponsored by the USAF Academy.

Further investigation of the Reichswehr undertaken at the Military Archives, Freiburg, West Germany.

30. Civil-Military Relations in 18th Century Virginia

Principal Investigator: Maj James R. Titus, Department of History.

Sponsored by the USAF Academy.

This research is for a doctoral dissertation that examines civil-military relations in 18th century Virginia.

31. General John B. Hood

Principal Investigator: Capt Robert E. Wolff, Department of History.

Sponsored by the USAF Academy.

Research resulted in 1500-word biographical sketch of General John B. Hood, to be published in a forthcoming volume, Dictionary of American Biography.

32. Linebacker II

Principal Investigators: Lt Col Jon A. Reynolds and Capt Robert E. Wolff, Department of History.

Sponsored by the USAF Academy.

Research by a former POW and B-52 pilot was presented jointly at the Western Social Science Association and appeared in Air Force Magazine.

F. Department of Law

1. Personal Estate Planning

Principal Investigator: Col Marcos E. Kinevan, Department of Law.

This work provides a comprehensive analyses of how to acquire, retain, manage, protect, and dispose of personal assets in ways that are most beneficial to the owners and their families. Topics include savings and credit, social security, estate programming, casualty insurance, life insurance, investment fundamentals, estate and gift taxation, forms of inter-spousal property co-ownership, trusts and wills.

Publication

Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1979, 265 pp., clothbound and paperbound.

2. Twenty-Five Years of Teaching Law to Undergraduates

Principal Investigator: Maj Phillip A. Johnson, Department of Law.

The history of instruction in law at the United States Air Force Academy was reviewed with particular attention to the purposes for which such instruction has been offered, the changing content of courses, and the composition of the department. Submitted in revised form to the Journal of Legal Education.

3. Financial Affairs Information for Retirees

Principal Investigator: Maj Phillip A. Johnson, Department of Law.

Legal research and opinion on recent developments in government benefit programs, estate and inheritance taxes, veterans

preference laws, dual compensation restrictions, and income taxes. Distributed at a program for Colorado Springs area Air Force retirees and their families on 25 August 1979.

4. Auditing of Faculty Activities

Principal Investigator: Maj Phillip A. Johnson, Department of Law.

An analysis of the mission and capabilities of the United States Air Force resident auditor function and an evaluation of the propriety of inquiries by the resident auditor into various activities and programs of the USAFA faculty.

5. Copyright Restrictions on Works Produced During USAFA Faculty Sabbaticals

Principal Investigators: Maj Phillip A. Johnson and Maj Michael R. Emerson, Department of Law.

Legal research and opinion concerning the publication of a bibliography compiled by a USAFA faculty member while on sabbatical. Whether such a work would be personally copyrightable entitling the author to royalties or a "work of the U. S. Government" is the key issue discussed.

6. Sanctions for Marijuana Use and Possession

Principal Investigator: Maj Michael R. Emerson, Department of Law.

This work consists of legal research and opinion which comprehensively explores current USAFA policy on sanctions for marijuana use and possession as contrasted with like policies of other USAF and non-USAF officer candidate programs to include other service academies. In addition, it discusses various USAF command policies concerning the effect of marijuana use on rated duties. Present sanctions are discussed, and possible alternatives suggested.

7. Collected Copyright Opinions

Principal Investigator: Maj Michael R. Emerson, Department of Law.

This work consists of a series of legal opinions and research on issues of copyright law of particular importance to the USAFA faculty. Examples include the following: whether the use of a major television network-copyrighted segment in a USAF training film produced at the Academy would not constitute an infringement because of the "fair use doctrine"; whether a book written by a USAFA faculty member is copyrightable by the U. S. Government though not written as a part of official duties because USAF facilities or talent were utilized in writing the book; and the classroom use of various copyrighted materials, books, videotapes, etc., without the copyright owner's permission under the "fair use doctrine."

8. Federal Incorporation of USAF Academy AOG

Principal Investigator: Capt George W. Ash, Department of Law.

Legal research and opinion concerning the practicality as well as the legal effect of federally-chartered incorporation of the USAFA Association of Graduates. An examination of the U. S. Code and the charters of existing corporations is included, along with appropriate recommendations.

9. Acceptance of NEH Grants by USAFA Faculty Members

Principal Investigator: Capt William M. Henabray, Jr., Department of Law.

Legal research and opinion concerning acceptance of National Endowment for the Humanities Grants by USAFA faculty members, in light of AFR 30-30 and other applicable regulations.

G. Department of Philosophy and Fine Arts

1. Managerial Integrity

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

This two-hour lecture is a continuing project, evolving through several years of research, concentrating on the ethical dimensions of personnel management.

Presentation

Versions of this lecture were presented at Maxwell AFB for the Advanced Personnel Management Course on 10 January 1979, 16 March 1979, 15 June 1979, and 20 September 1979.

2. The Moral Functions of the Chaplains in the Military Profession

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

An examination of the ethical issues in military organizations which generate some responsibilities for chaplains in addition to their normal functions as representatives of religious denominations.

Presentation

This lecture was presented at Maxwell AFB on 15 June 1979 for the Chaplains' School.

3. The Nature of Man

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

A three-hour lecture examining fundamental views of the nature of man developed in ancient Eastern Philosophies, the classical Greek tradition, Judaeo-Christian writings, and the works of modern European thinkers. The classical views were contrasted with those of contemporary existentialism, and special attention was given to comparisons of the Marxist view of man with that of the Greek-Judeo-Christian tradition.

Presentation

Served as the guest speaker for the Inter-American Defense College at Fort Lesley J. McNair, Washington, D. C., on 10 September 1979.

4. Ethics and Leadership

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

A two-hour presentation examining the ethical issues associated with military leadership in today's armed services.

Presentation

This lecture was presented for the Air Command and Staff College at Maxwell AFB on 23 August 1979.

5. Ethics and Leadership

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

An in-depth examination of the role of ethics in the military function, the ethical complexities which affected military leadership in the Vietnam War, the nature of the military profession, and problems of integrity in leadership confronting the modern army.

Presentation

Presented as two, four-hour workshops for Junior and Senior Army Commanders and Chaplains at Fort Gordon, GA, on 14 and 15 May 1979.

6. Ethics and the Military Profession

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

This study includes an analysis of the role of ethics in the military function and an examination of the nature and ultimate purpose of the military profession.

Presentation

This two-hour address was presented to the Armed Forces Staff College at Norfolk, VA, on 9 April 1979.

7. Ethics and the Medical Profession

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

An examination of ethical issues confronting the medical profession with critical attention to moral responsibilities inextricably associated with the medical profession.

Presentation

This one-hour presentation was given for the DoD Medical Region III Conference at the Air Force Academy, CO, on 26 October 1978.

8. National Leadership and Questions of Value

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

A brief look at the role which religious and moral values play in our national life, especially as those values relate to military and other government functions.

Presentation

This presentation was given at the National Prayer Breakfast at Francis E. Warren AFB, WY, on 31 January 1979.

9. Managerial Integrity

Principal Investigator: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

This work is part of a continuing study of professionalism in several vocations, applied in this instance to managers and administrators in the civilian environment.

Presentation

This two-hour lecture was given for the Administrative Management Society of Colorado Springs on 17 April 1979.

10. Morality and Military Obedience

Principal Investigator: Maj Kenneth H. Wenker, Department of Philosophy and Fine Arts.

A paper summarizing the results of previous research into the nature of obedience and the moral justification of obedience in a military setting.

Presentation

This major paper was given for "The Citizen-Soldier in Today's World," an interdisciplinary symposium, held at St. Michael's College, Winooski, VT, on 5 and 6 October 1979.

11. Managerial Ethics

Principal Investigator: Maj Kenneth H. Wenker, Department of Philosophy and Fine Arts.

A three-hour presentation on ethical concerns typically encountered in management. Emphasizes the need for moral decisions which are simultaneously autonomous and principled. Examines several such principles and applies them to situations common to the manager in government service.

Presentation

Presented to the Personnel Management for Executives Conferences #55, at San Antonio, TX, on 9 January 1979; #56 at Colorado Springs, CO, on 28 March 1979; #57 at Oklahoma City, OK, on 30 May 1979; and #58 at Lake Charles, LA, on 21 August 1979.

12. Ethics in Management

Principal Investigator: Maj Kenneth H. Wenker, Department of Philosophy and Fine Arts.

This paper adapts previous research into managerial ethics to the situation of the USAF Hospital commander.

Presentation

This major paper was delivered for the Management for Hospital Commanders Course at Sheppard AFB, TX, on 23 October 1978, 1 April 1979, and 16 September 1979.

13. Professional Ethics

Principal Investigator: Maj Kenneth H. Wenker, Department of Philosophy and Fine Arts.

A two-hour presentation on ethical concerns critical to the military profession. Emphasizes the need for moral character on the part of military managers. Develops some principles typically held by persons of moral character and applies them to the military setting.

Presentation

Presented to the Professional Personnel Management Course at Maxwell AFB, AL, on 10 May 1979.

14. Ethics Education at the Air Force Academy

Principal Investigator: Maj William H. Stayton, Department of Philosophy and Fine Arts.

A description of ethics education received by the cadets at the Air Force Academy, and a critical analysis of Adult Value Education as taught in ATC.

Presentation

This talk was presented as part of a workshop with ATC chaplains at Reese AFB, TX, on 25 September 1979.

15. War, Morality, and the Military Profession

Principal Investigator and Editor: Col Malham M. Wakin, Department of Philosophy and Fine Arts.

This anthology appropriately brings together material on two major topics: the military as a profession and morality and war. The articles in the first section stress the ethical dimensions of the military profession and juxtapose the positions of well-known scholars. Themes include the inextricable association of human values with the military profession, and the resolution required when crucial military values are at odds with the parent society.

Publication

This anthology was published in 1979 by Westview Press, Inc., of Boulder, CO.

16. Bentham and Pacifism

Principal Investigator: Maj James B. Dixon, Department of Philosophy and Fine Arts.

In a comment on Professor Edward Quest's paper, "Bentham and Pacifism," Major Dixon argued that Quest's conclusion that utilitarianism does not support the necessity for military threats is ill-founded.

Presentation

This talk was given at the American Philosophical Association, Pacific Division, on 25 March 1979, at San Diego, CA.

17. The Morality of War

Principal Investigator: Maj James B. Dixon, Department of Philosophy and Fine Arts.

In a review of Professor Michael Walzer's book, "Just and Unjust Wars," Major Dixon examines Walzer's theory of just wars and just acts in time of war. In particular, Walzer's theories of aggression, anticipations, interventions, and supreme emergencies are evaluated from a moral point of view.

Publication

This article was published in the September 1979 issue of the Queen's Quarterly Journal.

H. Department of Political Science

1. U. S. Canadian Defense and NATO Standardization

Principal Investigator: Lt Col Douglas J. Murray, Department of Political Science.

Reviews and evaluates the history of the U. S.-Canadian defense economic relationship and discusses the applicability of that relationship to NATO standardization effort.

Publication

Paper presented to the Association for Canadian Studies in the United States 5th Biennial conference, Washington, D. C., 28-30 September 1979.

2. Comparative Defense Policy

Principal Investigators: Lt Col Douglas J. Murray and Maj Paul R. Viotti, Department of Political Science.

A major research project involving comparative study of defense policy processes in the United States, the Soviet Union, China, Japan, West Germany, France, the U. K., Sweden, and Israel. Separate authors were commissioned to prepare articles on each country using a common framework prepared by the principal investigators and their associates.

Publication

Forthcoming as 2nd and completely revised edition of Comparative Defense Policy, Johns Hopkins University Press.

3. Operation Ranch Hand: The U. S. Air Force and the Use of Herbicides in Southeast Asia, 1961-1971

Principal Investigator: Capt William A. Buckingham, Jr., Department of Political Science.

This study chronicles the history of Operation Ranch Hand based upon research in primary sources. Included are policy decisions at the highest levels as well as the operational story of the Air Force unit which sprayed the herbicides.

Publication

Presently undergoing security review prior to publication by the Office of Air Force History and the Government Printing Office.

4. National Security Decision-Making by the President

Principal Investigator: Capt John F. Reichart, Department of Political Science.

This dissertation examines the relationship between the structures of the advisory system upon which the President relies for national security advice and the quality of advice he receives. Quality advice is defined in terms of the presence of seven process oriented criteria. The research suggests that differing structural arrangements of Presidential advisory systems have a significant impact on the presence or absence of the process criteria deemed necessary for good advice.

Publication

Published as a dissertation (National Security Advice to the President: A Comparative Case Study Analysis of the Structural Variable in Decision-Making) by the Ohio State University, Columbus, Ohio, 1979.

5. U. S. Constitutional Development

Principal Investigator: Lt Col Curtis Cook, Department of Political Science.

Consideration of the role of the Supreme Court and the principal developments in constitutional interpretation.

Presentation

Rhodes Scholarship Seminar, United States Air Force Academy, November 1978.

6. Duties of Politico-Military Affairs Officer

Principal Investigator: Lt Col Curtis Cook, Department of Political Science.

Humorous reflection on Col Cook's tour of duty in the Office of Secretary of Defense.

Presentation

Rhodes Scholarship Seminar, United States Air Force Academy, January 1979.

7. Kurdish Insurgency in Iraq

Principal Investigator: Maj Paul R. Viotti, Department of Political Science.

This article examines the Kurdish insurgency in terms of several key variables including leadership and external support.

Publication

Forthcoming in Political Violence and Insurgency, edited by Bard E. O'Neill and William R. Heaton, Westview Press.

8. Military Retirement and Compensation Systems

Principal Investigator: Maj Paul R. Viotti, Department of Political Science.

Based in part on research performed for the Office of Management and Budget, Executive Office of the President, this article examines proposals to change the military retirement and active duty pay systems.

Publication

Association of Graduates Magazine, Winter (February) 1979.

9. International Monetary Politics

Principal Investigator: Maj Paul R. Viotti, Department of Political Science.

This dissertation examines the politics associated with the construction, maintenance, and transformation of international monetary regimes from the 19th Century gold standard to the present regime of "managed flexibility."

Publication

Dissertation, University of California, Berkeley, fall 1978.

10. American Political Thought

Principal Investigator: Lt Col Curtis Cook, Department of Political Science.

This presentation outlined the main currents in American political thought in historical perspective under the headings: precedents, growth of a nation, Madisonian design, Jacksonianism, romanticism, human rights, industrialism, progressivism, and the New Deal.

Presentation

New instructors in political science during new instructor orientation, August 1979.

11. Strike Against Terror! The Role of Air Power in Counter-Terrorist Operations--The Case of Entebbe

Principal Investigator: Capt Douglas Menarchik, Department of Political Science.

The article discusses the threat of transnational agitational terrorism against U. S. interests abroad. It outlines the degree and intensity of terrorist threat against U. S. interests according to geographical area, attack modes used, and type targets. Given the background on the unique features of transnational agitational terrorism and the threat to U. S. interests, the article analyzes the decisions and management of the Israeli commando raid on Entebbe using five variables pertinent to planning such an air operation. It concludes with recommendations for U. S. counter-terrorist force planners.

Publication

Forthcoming in Air University Review.

12. Crisis Planning in Turkey

Principal Investigator: Capt Clay A. Stewart, Department of Political Science.

This presentation was part of research TDY to J-5 (Joint Chiefs of Staff), Crisis Planning and Action Group in summer 1979.

Presentation

Director, J-5 and working-level Turkey desk officers, summer 1979.

13. The Standardization of Weapon Systems in NATO

Principal Investigator: Capt Richard C. Fast, Department of Political Science.

Dissertation in preparation. An evaluation of the problems involved in implementing weapons standardization in NATO. Focuses primarily on the problems of getting approval in Congress, especially in the House, for procurement of foreign designed/produced systems. Having committed ourselves to the two-way street, failure to implement this approach will have significant political repercussions causing problems more serious than those standardization originally sought to remedy.

Publication

PhD Dissertation, forthcoming.

14. NATO and the Independent European Program Group (IEPG)

Principal Investigator: Maj John D. Szostak, Jr., Department of Political Science.

This paper provides an examination of the IEPG, focusing on its status and potential impact on NATO.

Publication

Paper prepared for the Office of Secretary of Defense, International Security Affairs, August 1978.

15. The Soviet Union Today

Principal Investigator: Maj Terry L. Heyns, Department of Political Science.

This presentation, the result of research and a field trip to the USSR, included a discussion of the life of Soviet citizens, Soviet efforts to improve the quality of life, and an assessment of future goals.

Presentation

USAF Intelligence School, Lowry AFB, 13 September 1979.

16. Urban Redevelopment and the Structure of Power

Principal Investigator: Maj Adolphus Andrews, Department of Political Science.

This dissertation examines the impact of private interests upon the policymaking process.

Publication

Forthcoming, Ohio State University.

17. Strategic Forces: The End of the Road?

Principal Investigator: Col Ervin J. Rokke, Department of Political Science.

This paper addressed current issues related to the reconciliation of strategy, resources for defense and force structure.

Presentation

National Security Education Seminar; Irvington, Virginia, December 1978.

18. Strategic Forces and SALT

Principal Investigator: Col Ervin J. Rokke, Department of Political Science.

This presentation focused on the criteria by which SALT II might be evaluated.

Presentation

Third Airpower Symposium; Air University, Maxwell AFB, AL, February 1979.

19. Politics and Reentry Technology

Principal Investigator: Capt Ralph A. Froehlich, Department of Political Science.

Paper focuses on goals and positions of the Carter Administration and the Congressional Armed Services and Appropriations Committees that could affect the general direction of future research and development of advanced reentry systems.

Publication

Paper prepared for the Program Director, Advanced Ballistic Reentry Systems, Space and Missile Systems Organization, winter 1978-1979.

20. Contexts of Presidential Decision-Making

Principal Investigator: Capt David C. Kozak, Department of Political Science.

This research design originated as the result of the investigator's experience teaching Pol Sci 484, The Presidency. This research culls from literature on presidential decision-making information on different decision contexts.

Publication

Article forthcoming.

21. Congressional Decision-Making

Principal Investigator: Capt David C. Kozak, Department of Political Science.

This is part of an ongoing effort based on 361 interviews collected among members of the U. S. House from February to July 1977. The major research finding is that Congressmen make up their minds differently on different kinds of issues; assessment is made of the bases on which these different choices are taken.

Publication

PhD dissertation, University of Pittsburgh, 1979.

22. Problems of Urban America

Principal Investigator: Capt David C. Kozak, Department of Political Science.

This presentation was given on Tracy Cooper's Radio Show, "On the Carpet" in May of 1979. It surveyed the various problems of American urban and metropolitan areas.

Presentation

Tracy Cooper's, "On the Carpet," May 1979, KVOR, Colorado Springs.

23. The Multiple Advocacy Approach to Presidential Decision-Making

Principal Investigator: Capt David C. Kozak, Department of Political Science.

This research critiques the prescription for multiple advocacy in presidential decision-making. Although acknowledging the general desirability of competing information and advisory sources, this research emphasizes the potential problems and pitfalls of excessible advocacy.

Publication

Presidential Studies Quarterly, forthcoming.

24. Local Political Participation

Principal Investigator: Capt David C. Kozak, Department of Political Science.

This presentation was made at the "Symposium on Growth and Government in El Paso County" held in May 1979 at Colorado College. The presentation discussed various modes of political participation at the local level. Various trends and problems of participation were noted. An effort was made to synthesize political science literature to local grass roots politics.

Presentation

Presented to the memberships of Colorado Springs Citizens' Goals and the Southern Colorado Chapter of the American Society for Public Administration, 1979.

25. Energy Policy

Principal Investigator: Capt James M. Keagle, Department of Political Science.

Energy Policy in the 1980s was discussed.

Presentation

Altrusa Club, Pueblo, Colorado, October 1978.

26. U. S. Foreign Policy and the Western Hemisphere

Principal Investigator: Capt James M. Keagle, Department of Political Science.

A critical evaluation of U. S. foreign policy toward countries in this hemisphere was made in terms of prevalent metaphors.

Presentation

National Defense Colloquium, USAFA, February 1979.

27. Energy and Public Policy

Principal Investigator: Capt Robert J. DeSutter, Department of Political Science.

The 21st Air Force Academy Assembly, a student conference supervised by Captain DeSutter, examined the implications of relying on various alternative energy sources.

Publication

Proceedings, 21st Air Force Academy Assembly, May 1979.

28. The President as Commander-in-Chief

Principal Investigator: Lt Col John D. Macartney, Department of Political Science.

This publication was made in Washington DC while serving as the USAF Academy Visiting Professor at the National War College. It outlined the President's role in foreign and defense policy formulation as well as his position as Commander-in-Chief and responsibilities regarding the release of nuclear weapons.

Publication

National Symposium held by the Center for the Study of the Presidency, 28 April 1979.

29. The Presidency and the Congress

Principal Investigator: Lt Col John D. Macartney, Department of Political Science.

This article was a required reading assignment for senior reserve and National Guard officers (O-6, O-7 and O-8) taking a summer PME course at the National Defense University and was prepared while the author was serving as the USAF Academy Visiting Professor at the National War College. It dealt with the often competitive roles played by the White House and Congress in the formulation of defense policy.

Publication

Defense Strategy Seminar 1979, National Defense University, Ft. McNair, Washington DC, 1979.

Publication

Defense Strategy Seminar 1979, National Defense University, Ft. McNair, Washington DC, 1979.

30. The Military Officer as Policymaker

Principal Investigator: Lt Col John D. Macartney, Department of Political Science.

This presentation was made to the National Defense Colloquium at the Academy in September 1979. The focus was on how defense policy is made in Washington and the role of the military officer as an actor in the political/policy arena.

Presentation

Presented to a dinner meeting of Academy officers and wives in September 1979.

31. Congressional District Offices: Their Staffs and Function

Principal Investigator: Lt Col John D. Macartney, Department of Political Science.

This paper was presented while TDY to the annual meeting of the APSA. It outlined the activities and impact of the thousands of congressional staffers who are deployed in congressional district offices throughout America, stressing the fact that, contrary to accepted wisdom, the legislative branch is deeply involved in the direct delivery of services and that significant electoral advantages accrue from the "servicing" of constituents.

Presentation

Presented at the annual meeting of the APSA, 2 September 1979, Washington DC.

32. Future Soviet-American Arms Control: Implications for NATO

Principal Investigator: Capt Frank G. Klotz, Department of Political Science.

This article considers several different issues associated with Soviet-American strategic arms talks that have special interest for the European members of the NATO alliance, including: Forward based systems, future European force options, technology transfers, force ceilings, and the cruise missile. This paper was originally presented to the Conference on New Approaches to East-West Arms Control, Cumberland Lodge, England, in May 1977.

Publication

Published in William H. Kincade, et. al. (eds.) Approaches to East-West Arms Control (Washington: The Arms Control Association/London: The International Institute for Strategic Studies, 1979).

33. Ethics and Warfare

Principal Investigator: Maj Paul R. Viotti, Department of Political Science.

Four-hour presentation on moral considerations associated with war and participation in war.

Presentation

Orientation School for Professional Ethics Representatives, June 1979.

34. Modernization, Transformation and Rectification: The "People Problem" in the PLA

Principal Investigator: Maj Richard J. Latham, Department of Political Science.

As modernization advances on four fronts in China, political leaders are rediscovering that accelerated economic and social change breed societal tensions. China's military forces have not been immune to those problems. This paper identifies and explores how the PLA is trying to modernize its people as well as its equipment.

Publication

Paper presented to the Association of Asian Studies, March 1980, Washington DC.

35. China After Chairman Mao

Principal Investigator: Maj Richard J. Latham, Department of Political Science.

This presentation was a lecture on the political, economic and military changes in China since Mao Tse-tung and Chou En-lai passed from the political scene.

Presentation

Presentation to the Joint Service Air Intelligence School, Lowry AFB, Colorado, October 1978.

36. Effects of Congressional Oversight and Executive Orders on the Intelligence Community

Principal Investigator: Maj Richard J. Latham, Department of Political Science.

This presentation was part of a three-day colloquium dealing with the U. S. intelligence community. The focus of this particular contribution was the nature of legislative and executive action to charter intelligence activities and prohibit abuses.

Presentation

Colloquium on Intelligence, Colorado College, 8 May 1979.

37. Modernization in the PLA: Air Power As a Case Study

Principal Investigator: Maj Richard J. Latham, Department of Political Science.

This paper analyzes the inherent problems China appears to face as it endeavors to modernize its military forces. It is argued that the Chinese face basic discontinuities in their development processes that result in aircraft that do not necessarily meet the tactical and strategic needs of the PRC Air Force.

Publication

Paper presented to the Western Conference of the Association of Asian Studies, 12-15 October 1978, Tucson, Arizona.

38. Vietnam's New Militancy

Principal Investigator: Maj Richard J. Latham, Department of Political Science.

Presented as part of a panel on the Sino-Vietnamese War of 1979, this paper examines the Vietnamese motives and objectives prior to the outbreak of hostilities in 1979. Particular attention is given to the Vietnam-Kampuchea border fighting, the Hoa problem in Vietnam, and the growth of Soviet influence in Indochina.

Publication

Paper presented to Asian Studies on the West Coast (ASPAC 79), 15-17 June 1979, Olympia, Washington.

39. Chinese Defense Policy: A Critical Bibliography

Principal Investigator: Maj Richard J. Latham, Department of Political Science.

This essay identifies for the student of defense policy the major research resources that are available on Chinese defense policy. Although not exhaustive, it does include most current resources and scholarship. With few exceptions, only English language sources are included.

Publication

Comparative Defense Policy, Douglas Murray and Paul Viotti, editors (Johns Hopkins University Press, forthcoming, 1980).

III. RESEARCH AND ANALYSIS OF SPACE AND WEAPONS SYSTEMS

A. Department of Astronautics and Computer Science

1. Research Support for the NAVSTAR Global Positioning System (GPS)

Principal Investigators: Project Officer, Maj Jackson R. Ferguson, Jr., Maj Leonard R. Kruczynski, Capt George T. Kroncke, 2/Lt Michael Novak, 2/Lt Joseph Difrancesco, Department of Astronautics and Computer Science.

Sponsored by GPS Joint Program Office (SAMSO/YE).

The Department of Astronautics and Computer Science is supporting the Global Positioning System Program by performing varied research as requested by SAMSO/YEE. The following topic has been researched by DFACS personnel.

GPS Magnetic Momentum Dumping Control Program

Principal Investigators: Capt Kroncke, Maj Ferguson, Department of Astronautics and Computer Science.

The Global Positioning System requires precise ephemeris data. A primary cause of ephemeris errors is the RCS momentum dumping. This research formulated and tested a ground based system to achieve magnetic momentum dumping.

An algorithm for determining the settings for residual field balancing magnets has been devised. Constraints are: (1) Only two magnets are available; (2) Switches occur within sight of a ground station; and (3) Commands cannot be stored on the spacecraft.

The method determines eight optimum magnet switch times over a two orbit period and produces magnet settings at these switch times that optimize the amount of momentum dumped. Testing of the algorithm with four on-orbit NAVSTAR Satellites shows that up to 20 days of momentum build up can be dumped in two orbits.

2. Effect of Intentional DoD Signal Degradation on a Civil Low Cost GPS Receiver

Principal Investigators: Maj Roger P. Neeland, Department of Astronautics and Computer Science.

Sponsored by the Office of Systems Engineering and Management, Federal Aviation Agency (FAA).

The Department of Defense is considering intentionally degrading the stability of the GPS navigation system to deny its full potential accuracy to non-DoD users. As the FAA is under increasing pressure to utilize GPS as an integral part of the National Airspace System, they are very interested in determining the effect of proposed degradation schemes on typical simple low cost receivers. This research involved coordination with the Air Staff and the National Security Agency (NSA) to determine the mechanism proposed to implement this degradation, and then determining how this might best be implemented (in an unclassified model) by various FAA contractors who are simulating low cost receivers and conducting pilot factor studies using these models. Such a model of the mechanism was determined and provided to FAA.

3. Advanced Laser Tracking Systems

Principal Investigator: Capt Ronald J. Lisowski, Department of Astronautics and Computer Science.

Sponsored by AF Weapons Lab (AFWL/ALO), Kirtland AFB, NM.

An optical device known as the Far Field Irradiance Maximization (FFIM) Sensor is being developed to use high accuracy pointing systems for future laser devices. The sensor is a shearing interferometer which derives tilt and focus errors in the optical wave front of a target image. Signals based on these errors are used to derive a deformable mirror to track the target. In order to do this the signals must be amplitude and phase demodulated. The project investigated the feasibility of using an Extended Kalman Filter to accomplish this demodulation in lieu of the phase-lock-loop currently being used. Preliminary results were favorable.

4. Research for Office of Special Projects (SAFSP-6)

Principal Investigator: Capt Peter A. Swan, Department of Astronautics and Computer Science.

Sponsored by the Office of Special Projects (SAFSP-6), Los Angeles AFS, CA.

Purpose of this research was to advise SP-6 in the survivability/vulnerability area.

5. Airborne Weapon Research

Principal Investigators: Lt Col Edward J. Bauman, Maj Roger P. Neeland, and Capt Joseph E. Justin, Department of Astronautics and Computer Science.

Associate Investigators: Maj Carl C. Schade, Capt Norman M. Beck, Jr., Capt James A. Davis, Capt Felix E. Morgan, Capt Randall L. Shepard, 2/Lt Salvatore J. Collura, Jr., 2/Lt Walter R. Davis, Jr., 2/Lt Henry A. Haisch, Jr., 2/Lt Frederick A. Lankford, 2/Lt William N. McCasland, 2/Lt Jay R. Snyder, and 2/Lt Francis E. Snyder.

Sponsored by the Air Force Avionics Laboratory (AFAL).

a. Electro-optical Tracker and Digital Estimators for Aerial Combat

A digital six-state estimator developed earlier here for the Bendix ASCOT (Adaptive Scan Optical Tracker) and implemented on a ROLM 1664 airborne minicomputer in conjunction with Bendix personnel and a consultant, Dr. Charles Fosha, is being used to estimate target position and tracking through regions of high optical clutter. Tracking filters for angle tracking, rate aiding, and weapon control system applications are being investigated. Further, infrared and charged coupled devices (CCD) sensors are being investigated.

b. Director Evaluation Flight Test (DEFT)

A director gunsight - one that has a tracker to estimate the target motion - is now being flight tested by the AFAL at Tyndall AFB, FL. DFACS is conducting supplementary analysis and simulation of the test conditions, flight data, and the measure of merit. Analysis software is being developed for duplication of flight test conditions on the simulator. The sample simulator experiment of the flight test and candidate systems including the trainable gun was an Astro 395 class project.

c. Integrated Flight/Fire Control (IFFC) - Firefly

The IFFC concept of using trackers to estimate target motion and feed and this information into the flight/fire control autopilot is being investigated in a flight test program - firefly -

on a F-15 aircraft. DFACS is currently implementing a similar reference autopilot in the simulator for testing with the director gunsight and tracking filters.

d. Missile Launch Envelope (MLE)

Airborne computer programs are being developed to better estimate the maximum and minimum effective range of air-to-air missiles and the launch "go or no go" conditions. The project is divided into the following tasks.

- The investigation of the MLE top-down engineering goals, evaluation methodologies, and candidate MLE algorithms and displays.

- The limited upgrade of the air-to-air simulator for MLE research with a fly out missile simulation. A candidate MLE deterministic algorithm, and display.

- A preliminary sample experiment conducted as a class project in Astro 395.

6. Satellite Data System Research

Principal Investigator: Capt Charles F. Stirling, Department of Astronautics and Computer Science.

Sponsored by Hq Air Force Space Division/YR at Los Angeles AFS, CA.

The support involves review of the technical status of the redesign effort underway to optimize the SDS payload for flight aboard the Space Shuttle Vehicle.

Areas completed include a review of the program test and evaluation effort and active participation in the "integrated functional flow" design effort completed in July 1979. Current support includes a review of PDR data for the new satellite design and continuing interface with the Martin-Marietta Corporation verification/validation efforts as Payload Integration Contractor.

7. Research for Office of Special Projects (SAFSP-6)

Principal Investigator: Capt Charles D. Friedenstien, Department of Astronautics and Computer Science.

Sponsored by the Office of Special Projects (SAFSP-6), Los Angeles AFS, CA.

The purpose of this research is to: (1) Consult on the orbit selection, spacecraft and payload design for a new USAF space system; (2) Review briefing material for Secretary of the Air Force; (3) Investigate the progress of the critical area of payload design and recommend FY 80 funding, contractors, and test objectives; and (4) Review test data from two experimental payloads which were flown as secondary missions.

B. Department of History

1. AFCMD's Role in Foreign Military Sales from 1972 - 1975

Principal Investigator: Maj Robert K. Tiernan, Department of History.

Sponsored by the Air Force System Command.

This research project is examining the role of AFCMD in foreign military sales between 1972 - 1975. A published report will follow.

C. Department of Mathematical Sciences

1. Safe Escape from Base Modeling

Principal Investigators: Lt Col W. T. Hodson and Maj J. C. H. Smith, Department of Mathematical Sciences.

Sponsored by the Air Force Weapons Laboratory.

The purpose of this project is to create a computer model which faithfully represents the process of alert aircraft escaping a base while under attack by an enemy SLBM force. A preliminary single base model and an integer programming formulation of the multibase model have been completed. Additional effort will be accomplished to meet specific needs of the user.

2. Data Link Vulnerability

Principal Investigators: Col R. Smith, AFTEC/DVAL, Capt R. F. Donohue, Jr., Department of Mathematical Sciences.

Sponsored by AFTEC/DVAL.

This project concerns the effects of jamming on command data links. Representative systems have been selected for study to determine if data link vulnerability can be classified in some way. These classifications will be used to provide a common comparison between current systems and later, between competing future systems.

IV. MANPOWER, PROCUREMENT AND LOGISTICS STUDIES

A. Department of Economics, Geography and Management

1. A Financial Analysis of Major Airframe Manufacturers

Principal Investigator: Maj James R. Woody, Department of Economics, Geography and Management.

The purpose of this research is to determine the best methodology for evaluating the financial risk of major airframe manufacturers. A recently developed DoD financial analysis program, FINANDAS, is being used to obtain data and perform analyses. FINANDAS is being tested on the historical data of two airframe manufacturers (Douglas & Lockheed) which almost experienced financial failure. From the ex-post analysis of Douglas and Lockheed, conclusions will be drawn concerning the best methodology for evaluating the financial risk of airframe manufacturers. This methodology will then be applied to other airframe manufacturers.

Publication

PhD Dissertation, forthcoming.

2. Cost Estimation for Propulsion Systems

Principal Investigator: Maj John W. Schuman, Department of Economics, Geography and Management.

Sponsored by ASD/ACCX.

The purpose of this project is to identify existing cost estimating methodologies used in estimating the cost of propulsion systems and to improve or develop new cost estimating relationships for use by ASD cost estimators.

3. An Economic Analysis of the Labor Market for Policemen

Principal Investigator: Capt James M. Norris, Department of Economics, Geography and Management.

This dissertation investigates the determinants of wages and employment of policemen in U. S. cities. The central hypothesis is that police departments are monopsonists in their relevant labor market and that they use this market power to suppress the wages of police officers. The empirical evidence supports this hypothesis.

Publication

PhD Dissertation, forthcoming.

4. Forecasting Expenditures for Weapons

Principal Investigator: Lt Col William J. Weida, Department of Economics, Geography and Management.

This paper investigates possible methods of forecasting defense expenditures in the presence of sparse data. The forecasts which are generated are for major weapon purchase categories or for standard military treasury code cost categories.

Presentation

USAFA-Rand Conference, USAF Academy, Colorado, 16 August 1979, and DoD Cost Analysis Symposium, Airlie Conference Center, Airlie, Virginia, 28 August 1979.

Publication

To be published as a USAF Academy Technical Report.

5. Achieving Socioeconomic Goals through the Federal Acquisition Process

Principal Investigator: Maj Richard J. Hampton, Department of Economics, Geography and Management.

The Commission on Government Procurement (COGP) issued its report in 1972. Three of its recommendations related to the use of the acquisition process to achieve national socioeconomic goals.

These included the recommendation to identify burdens to the acquisition process of using it to achieve socioeconomic objectives, raising the threshold of application of the programs, and having a comprehensive reevaluation of these programs. This research is developing a taxonomy of burdens and evaluating the feasibility of implementing the COGP recommendations.

Publication

PhD Dissertation, forthcoming.

6. Analysis of Career Progress for Air Force Academy Faculty

Principal Investigators: Maj Jeffrey D. Baker and 2/Lt Pat Davis, Department of Economics, Geography and Management.

Analysis is focused on some 1600 officers who remain on active duty and have been stationed at USAFA. The purpose is to track the career progression of these officers with special attention being given to the use of graduate education.

7. Socioeconomic Objectives--An Examination of Their Impact on Civil Agencies and the Department of Defense

Principal Investigator: Maj Richard J. Hampton, Department of Economics, Geography and Management.

This report discusses research which investigated the impact on the federal acquisition process of using the contract as a vehicle for accomplishing national priority socioeconomic objectives. The administrative and economic burdens of such programs as Davis-Baron, EEO, Buy American and other programs were discussed. Further, recommendations for policy revisions and areas for further research were presented.

Presentation

Eighth Annual DoD Acquisition Research Symposium, Newport, Rhode Island, 11 May 1979.

8. Cost Analysis of the USAFA T-43 Navigator Training Program

Principal Investigator: Lt Col William J. Weida, Department of Economics, Geography and Management.

Sponsored by the USAF Academy/CWIN.

The Academy T-43 program was compared for cost effectiveness to other methods of training navigators. (Unpublished)

9. An Evaluation of a Rand Approach to Comparison of U. S. and Soviet Military Investment Efficiency

Principal Investigator: Maj Leslie H. Kool, Department of Economics, Geography and Management.

The evaluation was completed. The Rand approach was found to be unacceptable by Net Assessments.

10. ERISA--Its Effects on Reporting and Disclosure for Pension Funds

Principal Investigator: Capt Robert E. Pizzi, Department of Economics, Geography and Management.

This paper examined the impact that the Employment Retirement Income Security Act would have on present and future accounting procedures employed to track pension funds. The paper also examined how the Act affected the safeguarding of the investment of pension monies.

Publication

Proceedings of the Tenth Annual American Institute of Decision Sciences Convention, 30 October - 1 November 1978.

11. Determining Governmental Disbursements from Normalized Spending Patterns

Principal Investigators: Lt Col William J. Weida, 2/Lt Steven D. Clark, and 2/Lt James E. Rowland, Department of Economics, Geography and Management.

Sponsored by SAF/FM.

These models are the culmination of an attempt to model the disbursement and reimbursement process in the Air Force. Data from every major treasury code category were gathered and investigated. It was determined that total yearly disbursements and

reimbursements in each category possessed so many random effects that accurate modeling was not possible. However, when the data were separated into fiscal year monies in each treasury code category, the ability to model the data changed completely. The fiscal year disbursement and reimbursement data showed that, in each case, monies were expended in an S-shaped, cumulative expenditure pattern over the spendout period. Forecasts from these separate fiscal year curves were then combined to establish the forecast outlays in each treasury code category by month. To fit the S-shaped fiscal curves, a method of splitting the curve at its inflection point and fitting both halves separately was developed. The end result was the construction of successful models for forecasting monthly outlays in every treasury code category of Air Force spending.

Publication

USAFA-TR-79-4, USAF Academy Technical Report, May 1979.

Presentation

DoD Cost Analysis Symposium, Airlie Conference Center, Airlie, Virginia, 29 August 1979.

12. Management Consulting for Cruise Missile SPO

Principal Investigator: Maj Thomas E. Jonak, Department of Economics, Geography and Management.

Sponsored by the Joint Cruise Missile Program Office.

This consulting effort consisted of a prioritization of the flight test objectives for the Air Launch Cruise Missile flight test program, in the likely event that all of the planned test missions are not flown due to the test completion date constraint.

Presentation

SPO Director, Washington, DC, 2 July 1979.

13. Professional Military Education and Executive Leadership and Management Development

Principal Investigators: Lt Col Robert L. Taylor and Capt Deonn M. Wall, Department of Economics, Geography and Management.

Air Force Professional Military Education (PME) is examined in a framework of a generic model of executive leadership and management development in public and private sector organizations. Comparative analyses are made on the basis of goals, target populations, timing, and costs for junior-, mid-, and senior-level managers/officers. A number of differences are noted suggesting that such a comparison may be inappropriate because of the military-unique topics necessary to prepare Air Force leaders for the future. This is a PME goal that differs significantly from the peace time requirement of executive leadership and management development common to all large organizations. A major contribution of the report is a comprehensive 130-item annotated bibliography of all of the books and articles published since 1974 relevant to the topic.

Publication

USAF Academy Technical Report, forthcoming.

Presentation

AU/CC, Maxwell AFB, Alabama, 24 September 1979; ATC/CC, Randolph AFB, Texas, 25 September 1979; AF/MP, Pentagon, Washington, D. C., 26 September 1979; SAF/MI and SAF/US, Pentagon, Washington, D. C., 26 September 1979.

14. Leadership in the 1980s: Theory and Applications for the Military Manager--A Review and Annotated Bibliography

Principal Investigators: Lt Col Robert L. Taylor and 2/Lt Philip A. Farrell, Department of Economics, Geography and Management.

This report categorizes and summarizes current leadership theory and trends. A brief historical perspective is presented to establish a common base for the discussion of current well-documented leadership theories. The bulk of the report is a comprehensive annotated bibliography covering the years 1974 - 1978. Seventy-eight books and separately published papers, as well as 121 articles, are listed to aid the reader in his further study of leadership.

Publication

USAFA-TR-79-2, USAF Academy Technical Report, March 1979.

15. The Business Policy Approach to Strategic Planning: An Annotated Bibliography

Principal Investigators: Lt Col Robert L. Taylor, 2/Lt James E. Rowland, and 2/Lt Michael Frey, Department of Economics, Geography and Management.

Seventeen books and 53 articles on strategic, long-range planning are reviewed. Only current articles with implications for Air Force strategists are included in the bibliography.

Publication

USAFA-TN-79-4, USAF Academy Technical Note, May 1979.

16. Military Cost Analysis

Principal Investigator: Maj Stephen H. Russell, Department of Economics, Geography and Management.

This text introduces students to the world of military cost analysis by addressing the learning curve phenomenon, cost estimating relationships, analysis of specific airframe production cost elements, and the production scheduling problem. The concept of an optimal rate of production is also explored. The text includes a set of learning curve tables and a series of practice exercises in military cost analysis.

Publication

USAFA/DFEGM text.

17. The U. S. Versus the Soviet Incentive Models

Principal Investigator: Maj Gregory G. Hildebrandt, Department of Economics, Geography and Management.

The report is concerned with models of the use of performance incentives in the Soviet Union and United States. The principal analytical result is an extension of an analysis of the methods whereby Soviet planners make the decision about production targets a variable under control of the producer, who is the only one possessing a knowledge of the uncertain conditions of production. It is shown that this device can be viewed as a classical inventory problem. There is also an examination of the "U. S. incentive

program" referring to multi-incentive contracts in which the profits received by the private producers are related to performance, outcome, and cost. The analysis describes how this device can be extended to solve the target output selection problem of the Soviet planning system.

Presentation

USAFA-Rand Conference on the Economics of National Security, 15-18 August 1979.

Publication

Naval Research Logistics Quarterly, March 1980.

18. Performance Incentives and Planning Under Uncertainty

Principal Investigator: Maj Gregory G. Hildebrandt, Department of Economics, Geography and Management.

Associate Investigator: Dr. Laura D'Andrea Tyson, Princeton University.

The report discusses the use of the performance incentive function (PIF) by planning organizations when there is subjective or objective uncertainty. It is proved that a PIF can be constructed which achieves both allocational and distributional optimality, when there is subjective uncertainty about the conditions of production and both the center and the producer are risk averse. When there is objective uncertainty, however, it is shown that it is not, in general, possible for the center to achieve these two objectives simultaneously.

Presentation

Conference on Use of Incentives in Eastern Europe, Wayne State University, Detroit, October 1978.

Publication

Journal of Comparative Economics, Vol. 3, No. 3, pp. 217-232, September 1979.

19. Identifying Criteria for Performance Appraisal Decisions

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Associate Investigator: Dr. W. D. Wilsted.

Appraising employee performance has long been regarded as an important part of the management function, for purposes of salary administration and recognizing future management potential. More recently, performance appraisal has been recognized for its value as one of several tools available to organizations for employee motivation. Central to such programs as "Management by Objectives," for example, is the motivational value of participatively developed goals, clearly communicated and supported with a clear and accurate perception by the subordinate regarding the criteria to be applied in appraising his performance against those goals. Indeed, what is perceived by individuals is often more important than "reality" in influencing behavior. Selective filtration by superiors and subordinates depends on the trust established, and serves to set expectations for performance in the work environment. Individuals function on the basis of perceptions. Accurate perceptions of the performance appraisal criteria by those being evaluated is essential to the motivational objectives of appraisal. Yet, even in the most formal rating programs, the ratee's perception of appraisal criteria often varies widely from that actually employed.

Publication

The Journal of Management Studies (October 1978), pp. 255-264.

20. Program Planning and Implementation

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

This research provides a concise summary of PERT and other program planning techniques for the practicing manager. Step-by-step guidelines are provided to help the reader understand and apply planning tools for large-scale programs in organizations.

Publication

In Lester Bittel, ed., Handbook of Professional Management (New York: McGraw-Hill, 1979), pp. 1009-1116.

21. Performance Appraisal--Alternatives for the Air Force

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Sponsored by AFMPC/MPCZ.

Current performance appraisal theory suggests that people in organizations today want and need frequent feedback on past performance and potential. A review of the research suggests that traditional techniques do not provide sufficient feedback. Several alternatives are proposed to encourage subordinate participation in the development of a follow-on performance appraisal system in the Air Force.

Presentation

AFMPC OER Working Group, Randolph AFB, Texas, March 1979.

22. Human Resource Accounting

Principal Investigator: Capt Stanley D. Griffis, Department of Economics, Geography and Management.

The research applies cost-benefit analyses to the personnel training and development decision making processes. The decision making compares the present value of the cost of the intended action with the present value of the expected benefits to be derived (future income of the individual is used as a surrogate measure of future value).

Publication

PhD Dissertation, forthcoming.

23. Economics and U. S. Military Aircraft Sales to Asia

Principal Investigator: Maj Russell T. Reston, Department of Economics, Geography and Management.

Sponsored by OASD/ISA/IEA.

Using specific cases of international transfers of U. S. military aircraft, this paper will identify and analyze those economic factors which will probably carry the greatest weight

in the minds of Asian policy makers who must decide on specific methods of acquiring U. S. military aircraft.

24. Forecasting Expenditures for Simulation Test

Principal Investigator: Capt Harry W. Rosen, Department of Economics, Geography and Management.

Sponsored by FC DNA.

Research for field command of the Defense Nuclear Agency at Kirtland AFB, New Mexico. Areas of research include: (1) Applicability of using the S-shaped curve as a forecasting tool for projection of expenditures of underground nuclear, high explosive, and nuclear weapon effect simulator tests; (2) incorporation of a computerized PERT package which would improve and combine the scheduling, budgeting, and analysis techniques for management of underground nuclear, high explosive and nuclear weapon effect simulator test programs.

25. Resource Allocation in a Decentralized Organization--A Case Study of MAC

Principal Investigator: Capt Dennis R. McLain, Department of Economics, Geography and Management.

This research, undertaken for the purpose of completing a doctoral thesis, concerns the design of information systems suitable for efficiently allocating resources in a decentralized organization. The design is based on decomposing a linear program that specifies constraints on and the uses of resources by an organization. The specific case of allocating flying hours in MAC is addressed.

Publication

PhD Dissertation, forthcoming.

26. MAC Aeromedical Airlift Study

Principal Investigator: Capt Dennis R. McLain, Department of Economics, Geography and Management.

Finding a set of demand-responsive schedules for a small number of aircraft that pick up and deliver patients is a difficult "many-to-many," multi-vehicle routing problem. To date, the

literature and recent efforts by researchers have been reviewed and found lacking current efforts involving characterizing the MAC problem by examining actual patient movement data over three months, and theoretical development of an algorithm that will assign patients to aircraft and routes.

Presentation

TIMS/ORSA Joint National Meeting, Milwaukee, forthcoming (18 October 1979).

27. The Technological Gatekeeper Over Time

Principal Investigator: Lt Col Robert L. Taylor, Department of Economics, Geography and Management.

Sponsored by AF/OSR.

This study reflects a longitudinal study of 184 scientists and engineers at Military Research and Development Laboratory. A series of measurements identified several individuals who were high internal communicators and who had the greatest number of communication contacts external to the laboratory. These technological gatekeepers are followed over time with effectiveness measures compared in relation to changing work assignments, physical relocation, and administrative change.

B. Department of Mathematical Sciences

1. Air Force Base Supply Study

Principal Investigators: Lt Col C. R. Mitchell, Lt Col R. A. Rappold, Department of Mathematical Sciences.

Sponsored by the Air Force Logistics Management Center.

Several probability models exist to describe the total units demanded for an Economic Order Quantity type item during stock replenishment (called lead time). In this research both demand and lead time are assumed to be random variables and we empirically study their marginal distributions. Data from several large Air Force base supply accounts are used. The main application of a lead time distribution will be in setting a reorder point for each part in the Air Force supply system.

Presentation

TIMS/ORSA national conference in New Orleans, LA, 2 May 1979.

2. Statistical Procedures for Large Scale Simulation Models

Principal Investigators: Maj Warren Langley, Frank J. Seiler Research Lab, and Capt Jon T. Peters, Department of Mathematical Sciences.

Sponsored by the Military Airlift Command.

This project is a study of a large scale simulation model (COLOSSUS) of the USAF airlift system as developed by the Military Airlift Command. Because of the comprehensiveness and detail in the model, it was originally estimated that computer runs of large scenarios would take five hours of CPU time and all available core (190K) on a Honeywell 6080. The model was improved and is now operating more efficiently. Maj Langley and Capt Peters are now directing their efforts toward smaller model segments to see what, if any, improvements can be made there.